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ABSTRACT

This document reports the origins and development of the DISTAR system of instruction. DISTAR is a set of programed instructional materials for teaching reading, language, and arithmetic basic concepts and skills that children need for success in school. The report describes (1) the key ideas of the personnel involved in creating the system, (2) the original versions of and the modifications to the product, (3) the diffusion strategies and the resulting product adoption, (4) some of the crucial decisions made during the product's life, and (5) its future as an academic boost for disadvantaged children. One section includes evaluations of DISTAR and comparisons of this program with other instructional programs. (RA)

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PRODUCT DEVELOPMENT REPORT NO. 14

DISTAR INSTRUCTIONAL SYSTEM

Developed By
Siegfried Engelmann & Associates
The University of Oregon

January, 1972

Contract No. OEC-0-70-4892

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American Institutes for Research
in the Behavioral Sciences

Palo Alto, California

January, 1972

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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PREFACE

This product development report is one of 21 such reports, each dealing with the developmental history of a recent educational product. A list of the 21 products, and the agencies responsible for their development, is contained in Appendix C to this report. The study, of which this report is a component, was supported by U.S. Office of Education Contract No. OEC-0-70-4892, entitled "The Evaluation of the Impact of Educational Research and Development Products." The overall project was designed to examine the process of development of "successful educational products."

This report represents a relatively unique attempt to document what occurred in the development of a recent educational product that appears to have potential impact. The report is based upon published materials, documents in the files of the developing agency, and interviews with staff who were involved in the development of the product. A draft of each study was reviewed by the developer's staff. Generally, their suggestions for revisions were incorporated into the text; however, complete responsibility for interpretations concerning any facet of development, evaluation, and diffusion rests with the authors of this report.

Although awareness of the full impact of the study requires reading both the individual product development reports and the separate final report, each study may be read individually. For a quick overview of essential events in the product history, the reader is referred to those sections of the report containing the flow chart and the critical decision record.

The final report contains: a complete discussion of the procedures and the selection criteria used to identify exemplary educational products; generalizations drawn from the 21 product development case studies; a comparison of these generalizations with hypotheses currently existing in the literature regarding the processes of innovation and change; and the identification of some proposed data sources through which the U.S. Office of Education could monitor the impact of developing products. The final report also includes a detailed outline of the search procedures and the information sought for each case report.

Permanent project staff consisted of Calvin E. Wright, Principal Investigator; Jack J. Crawford, Project Director; Daniel W. Kratochvil, Research Scientist; and Carolyn A. Morrow, Administrative Assistant. In addition, other staff who assisted in the preparation of individual product reports are identified on the appropriate title pages. The Project Monitor was Dr. Alice Y. Scates of the USOE Office of Program Planning and Evaluation.

Sincere gratitude is extended to those overburdened staff members of the 21 product development studies who courteously and freely gave their time so that we might present a detailed and relatively accurate picture of the events in the development of some exemplary educational research and development products. If we have chronicled a just and moderately complete account of the birth of these products and the hard work that spawned them, credit lies with those staff members of each product development team who ransacked memory and files to recreate history.

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PRODUCT DESCRIPTION

Product Characteristics

Name

The Distar Instructional System. The name "Distar" is a trademark of Science Research Associates, Inc. (SRA) which identifies Reading, Language, Arithmetic and related programs developed by Siegfried Engelmann and others and published by Science Research Associates, Inc.

Developer

A group of educational specialists developed the reading, language and arithmetic programs comprising the Distar Instructional System. Siegfried Engelmann, who is an associate professor in the Department of Special Education, University of Oregon, co-authored all three programs. Elaine C. Bruner, formerly an educational specialist at the Bureau of Educational Research, University of Illinois, co-authored the reading program. Jean Osborn, assistant professor of education at the University of Oregon, and Therese Engelmann, writer on early childhood education, are co-authors of the language program. Doug Carnine, an associate with the Department of Special Education, University of Oregon, is co-author of the arithmetic program.

Distributor

Science Research Associates, Inc., publishes and distributes the Distar Reading I and II, Distar Language I and II, and Distar Arithmetic I and II programs, the Distar Library Series, the Distar and Strategy Games, and various informational and training materials for the Distar Instructional System. SRA also plans to publish and distribute Distar Reading III, Language III, and Arithmetic III programs in the 1972-73 school year.

Focus

The Distar Instructional System is designed to help the child develop the basic concepts and skills in reading, language, and arithmetic which he will need for success in school. No assumptions are made concerning the children's previous achievement level when they enter the program.

Grade Level

The three Distar programs form a learning system appropriate for preschool, kindergarten, and the primary grades. The system is also applicable for special remedial work with older children and with children who speak English as a second language.

Target Population

The target population consists of children who have not learned basic reading, language, and arithmetic skills. The original target population--when the first prototype materials were prepared--was preschool, kindergarten, and primary grade disadvantaged children. The original scope of the system, however, has broadened so that the target population encompasses all children, including the average, the above average, the disadvantaged, children with learning disabilities, and those considered mentally educable or trainable mentally retarded students. The system is not confined to any particular geographic, demographic, or racial-ethnic population.

Rationale for Product

Long Range Goals of Product

The Distar Instructional System is being continually expanded, with Distar Level III material for arithmetic, language, and reading planned for commercial publication. Additional material which might become part of the system is being developed by Engelmann and his colleagues in a number of areas, such as extensions of arithmetic, language, and social studies.

The Distar system is being improved by constant revision as data is fed back from the users of the Distar programs. Along with the long range goals of Engelmann and the Engelmann-Becker Corporation of extending coverage to the upper elementary grades, both Engelmann and SRA have goals to improve the existing programs and to widen the distribution of the Distar programs.

Objectives of Product

The objectives of the Distar Instructional System are to develop the basic concepts and skills in reading, language, and arithmetic which the child needs to be successful in school. These skills include language skills which focus on the language used in the classroom in teaching any of the subjects, rather than social usage language, followed by further development of

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the skills needed to analyze language and to describe qualities and relationships observed in the surroundings. Reading skills develop those techniques necessary to look at a word, to sound it out, and to say it, followed by development of reading comprehension and advanced reading skills. In the arithmetic programs, the child is taught to count from specific numbers, to follow directions, to identify the operational signs for addition, subtraction, and multiplication. He is taught to perform arithmetical operations and to proceed into problem solving skills.

The programs have been constructed so that specific educational objectives are stated as a series of specific tasks. The objectives determine how the presentation is to be made and the behavior the teacher must exhibit. Successful accomplishment of the objectives is determined by the feedback of information the teacher receives from the children and by the tests incorporated into the program.

Philosophy and Theories Supporting Product

The Distar system has developed from the basic ideas that children learn what they are taught, that the necessary basic skills and concepts are the same for all children, that IQ is a function of teaching, and that it is possible to teach all of these necessary skills and concepts by means of a suitable instructional program. Such a program may be developed by performing a thorough task analysis, logically programming the task components, prescribing teaching routines incorporating correction procedures, emphasizing reinforcement techniques, and incorporating testing to be used as a teaching aid as well as a means of determining what the children have been taught. The system is designed to be presented to small groups, requiring maximum participation of each child, giving the benefits of individual instruction with maximum instantaneous feedback to the teacher. Emphasis is constantly placed upon the idea of success rather than failure.

The authors stress that it is important for every child to develop certain skills and maintain that it is possible for virtually all children to be taught by the Distar programs. With the Distar programs, the problem learners are not channeled off into "special classes" and excused from achieving excellence, but are brought through the programs by smaller, but positive steps. Emphasis is placed on the tasks which the child must learn and not on his special characteristics or disabilities. In this approach, the tasks and materials are the same for all children.

The programs, as noted above, are developed on the theory that children learn what they are taught and, if they know what they are taught, then IQ is a function of teaching. A low IQ score, then, indicates that a child has not been taught certain skills, but in no way tells how much he is capable of learning. Believing that learning is the function of teaching, the developers of the Distar system present teaching as sequences of properly programmed tasks taught one at a time by specified teaching techniques.

Thus, the developers' approach has been to define those basic skills and concepts which all children should learn; to analyze the tasks required; to break the tasks down into component parts; and to teach those parts in an orderly, straightforward prescribed presentation at an optimum rate accompanied by some slight stress which is within the child's capabilities, but directed toward challenging, and not frustrating, the child. The procedure of task analysis involves identification of the set of characteristics defining the skill or concept; the identification of the set of characteristics defining the non-concept or non-operation; and the identification of the set of characteristics which are irrelevant. If the programming of the necessary tasks is successful, the child will develop the ability to discriminate the set of essential characteristics that define the concept or action from other non-essential characteristics, and will be able to discriminate the objects or actions which possess those essential characteristics from those which do not.

Features of the task programming principles may be summarized in the following list:

1. Determine the objective which the child is to give evidence of knowing or being able to demonstrate.

2. Determine the universe of the concept or operation.

3. Decide on the instances or examples to be used in the program step. Positive and non-positive examples may be presented. Examples very much like the ones being taught may be presented with diverging degrees of similarity or variations of irrelevant characteristics.

4. Never assume that children will note, on their own, single characteristics which distinguish similar items.

5. Anticipate difficult discriminations.

6. Prepare for difficult discriminations.

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7. Allow for a systematic correction procedure.

8. Test for mastery.

9. Repeat failed material.

The teaching of the programmed tasks follows a prescribed routine which should be learned by the teacher prior to teaching the Distar programs and should be followed precisely. The program is designed so that the teacher is provided with everything she is to say, how she is to signal the children to respond, when she is to praise, and how she is to handle incorrect answers. A minimum of teacher preparation time is required for the daily lessons so the teacher is free to concentrate on perfecting the presentations and to pursue other teaching activities. Throughout the instructional programs, liberal use is made of reinforcement techniques to develop desired responses and behavior patterns. Also, similar techniques are applied in the development of the general classroom behavior to provide the setting in which the Distar system can be used optimally. The techniques are regarded as sufficiently important to justify detailed teacher training. In the teaching of the Distar programs, the teacher works with small groups of children and the required responses, called for by a signaling cue, are given verbally or in some cases by other visible activity. In this planned manner, the teacher receives immediate feedback from each child in a minimum of response time, and she can sense any errors in the response or detect any hesitations by unsure or timid children waiting for the lead or cue of another child. In a sense, each child is receiving individual instruction as he must actively participate at all times and each response to the material is evaluated.

The lesson format, teaching procedures, and repetitions of patterned responses are in the form of drill routines. Siegfried Engelmann, co-author of the Distar programs, is careful to distinguish between drill and rote learning by stating that the two differ according to purpose. He considers rote learning as practice on idiomatic information which has little general utility and is generally useless, while drill is practice which is used to insure student mastery of non-idiomatic, highly generalized patterns, and is valuable.

Review lessons and tests are integral parts of the programs and levels of achievement are clearly specified for these items as well as the levels

which the children's responses must achieve. The tests are not regarded as an end in themselves, but serve in a teaching function. If an item is failed, the teacher follows a prescribed correction procedure, which takes little time away from the class, to bring the child up to criterion before he proceeds to the next task.

Exercises in all programs, printed on single sheets, are distributed by the teacher as rewards for successful performance. These are called Take-Homes.

The Distar programs have been developed with the idea that in the learning encounter the child is developing content-dependent concepts and content-independent concepts which include concepts the child is developing about himself.

The programs have been structured so that children learn positive things about themselves, using materials they enjoy in a manner that is active, fun, and fast moving, accompanied by liberal praise. Emphasis is placed upon the successes of the children and increasing their reliance on their own judgments.

Description of Materials

Organization and Content of Materials

The Distar Instructional System is organized into the Reading I and II, Language I and II, and Arithmetic I and II programs. Level III programs in each subject are also planned for commercial publication. Approximately a year's time is required for a typical group to complete one level of a program; however, some groups of children may move at a faster rate and finish a level sooner (thus moving into the next level), while others may require more than a year to complete a level.

Content organization of levels I and II of the three programs can be summarized as follows: Reading I concentrates on the skills necessary to look at a word, to sound it out, and to say it, while Reading II emphasizes comprehension and advanced reading skills and teaches the student to follow directions. Language I focuses on the language the teacher uses in the classroom, the language of instruction used in teaching arithmetic, reading, science, social science, etc., followed by Language II which stresses the skills children need to analyze language and to describe qualities and relationships observed in the surrounding world. The third program, Arithmetic,

teaches the child to count from specific numbers, to follow directions, and to identify, understand and use numerals, the plus and minus signs, and the symbols for equality and inequality.

Language I. Specific topics presented in Language I are the following:

Presentation Book A (Part I and Part II), Lessons 1-180

Identity statements
Polars
Prepositions
Pronouns
Multiple attributes
Comparatives-superlatives
Location
Same-different
Only

Presentation Book B (Part I and Part II), Lessons 1-180

Action statements
Categories
Plurals
Why
Verbs of the senses
Verb tense
If-then
Before-after

Presentation Book C (Part I and Part II), Lessons 1-180

Parts
Or
All
One
Some, all, none

The concepts are organized into 180 daily lessons, each lasting about 30 minutes. A typical Language I lesson will consist of presentations from Book A, Book B, and Book C, followed by a story from the Storybook incorporating concepts taught in the lesson and award of a Take-Home to each

child who earns one. In the presentation books, review materials are frequently incorporated, as more than one concept is often taught in a lesson and usually the teaching of a concept extends over several days. A test is placed at the beginning of the program to determine the point of entry into the program. Other tests follow throughout the presentation materials to evaluate content mastery and to direct the child's progress to the successive lessons.

The Language I Storybook contains stories based on the language concepts taught in the presentation books and is incorporated into lessons 16-180. These stories are designed so that each one focuses on a specific set of skills that the children have just learned from the presentation books. The stories let the children hear and use the language in a natural way. Some stories appear in two versions, an introductory presentation and later a review version. Stories appearing one time only and the first version of the story with multiple presentations are accompanied by a great number of questions about the story and about what the characters are saying. The review version contains fewer questions and is covered more rapidly. Most of the stories are organized for two-day presentations.

The Language I Color Book, consisting of 61 presentations, introduces red, yellow, blue, black, white, green, orange, purple, brown, and pink colors. Patterns studied are stripes, spots, checks, and flowers. Shapes taught are the rectangle, triangle, circle, oval, and square.

The Take-Homes, which serve as rewards and as practice exercises for all lessons, contain exercises directly related to the skills developed during the lesson presentations.

The Teacher's Guide provides the teacher with an overview of Distar Language I, directions and background about how to teach Language I. Additional details are provided about teaching specifically the preprogram portion, Books A, B and C, the Storybook, the Take-Homes, and the Color Book. An overall schedule showing the sequencing of the concepts is provided in Appendix A, as are additional charts showing locations of the concepts in the specific materials and applicable lesson numbers.

Language II. The Distar Language II program is developed through a series of 180 daily lessons, each lasting about 35 minutes. The materials include five presentation books (A, B, C, D, and E), a storybook, 180 Take-Homes, and a teacher's guide.

Distar Language II commences with a review of some of the concepts developed in Language I. These are as follows:

If-then
Some, all, none, one
Or
Only
Parts
Location
Same-Different
Before-after
Multiple attributes
Comparatives-superlatives
Verb tense

New topics are commenced at presentation 8 and are as follows:

Can do
Materials
Opposites
Synonyms
Description
Questioning Skills
Classification
Definition
Left-right
Following instructions
Analogies
Statements
Absurdity
Function
Problem solving
Vocabulary review
Deductions
Information:
  Visual properties
  Animals
  Calendar
  Trees
  Occupation
  Measurement
  Seasons

As in Language I, the basic presentations are developed with the presentation books. The presentations are followed by the Take-Homes which provide practice materials for the skills taught and serve as rewards for working hard. The Take-Homes place particular emphasis on location, parts, synonyms, opposites, classification, left-right, statements, following instructions, absurdity, information: animals, information: occupations, and information: seasons.

The Language II Storybook is not presented during the structured lesson session, but at another time during the day. The book contains 23 stories; four are review and 19 are new. The stories follow the same format as Level I and the new stories tie in with information that the children learn about different occupations during the structured lesson sessions. The final stories increase in length so that they are nearly twice as long as the earlier ones and the number of questions the teacher is to ask is reduced.

The teacher's guide provides general information about the Language II program as a whole, information about effective teaching of the program, and specific suggestions for teaching the more difficult tasks. A scope and sequence chart and topic indexes are included in Appendix B.

Reading I. Reading I is sequenced into 159 presentations of approximately 30 minutes each. Topics covered in the program and the recommended time limits to be allowed on the specific item in a presentation are shown below.

Book and Topic	Presentation Numbers	Recommended Time Limits During a Lesson
Related Skills Book		
symbol-action games	1-17	5-6 minutes per day
blending-spelling by sounds	17-60	4-5 minutes per day
blending-say it fast	1-40	4-5 minutes per day
rhyming	6-27	5-6 minutes per day
symbols-say it fast	30-39	4-6 minutes per day
Sounds and Reading Sounds Books		
Sounds	1-159	3-5 minutes per day
Book A (1-58)		
Book B (59-109)		
Book C (110-159)		
Reading Sounds	26-159	5-10 minutes per day
Book A (26-58)		
Book B (59-109)		
Book C (110-159)		
Take-Homes		
Blending Sheets	1-5	3-4 minutes per day
Sound-Symbol Sheets	1-39	3-5 minutes per day
Stories and Writing Sheets	40-159	10-15 minutes per day
Workbook (Worksheets)	32-159	5-6 minutes per day

From the above table it can be seen that a daily lesson is comprised of activities involving several different aspects of skills related to reading. Not all of these activities extend throughout the program, since some are designed to lay the foundation for later activities introduced. In addition to the teacher presentation books, student Take-Homes are used for reward and skill reinforcement and are needed for all presentations. They start out simple but become more complex with the stories beginning with presentation 40. The number of words in the stories increases as the children

progress through the program, so that the final stories contain between 180 and 200 words.

Workbook worksheets are used in the lessons for presentations 32-159 and emphasize the skills and concepts taught in the sounds and reading sounds presentations. The beginning tasks are relatively easy, followed by variations on the tasks. Different tasks are then introduced eventually leading to tasks that involve associating appropriate statements with pictures and translating pictures or representations into statements.

The teacher's guide is applicable to Reading I and II. It provides general information about the reading program as a whole and effective teaching of the program, as well as specific instruction on teaching of the specific aspects of it. Pronunciation guides, topic index material, and scope and sequence charts are included. Sound recordings showing pronunciations and teaching and correction techniques are provided for the teacher.

Distar Reading materials consistently relate the sound with the symbol. The student is taught the sound of approximately 40 symbols in Reading I. They include the lowercase letters of the alphabet, certain joined letters that are sounded together such as "th," and the long vowels with diacritical marks. As an aid to pronunciation of words, silent letters appear in small type.

To minimize student confusion, the shapes of symbols that look alike, such as b and d, have been modified slightly. These letters are taught at widely spaced intervals to make certain the student knows the sound of one symbol before he is introduced to another with a similar shape.

The student is also given special aids such as markers that separate words, left to right directional arrows, and arrows from the end of one line to the beginning of the next.

In Reading II these special prompts and aids are gradually phased out. The student is reading stories with upper and lowercase letters by the end of the program.

Reading II. Presentations for Reading II continue in a similar manner to those of Reading I, developing new word attack skills in three Sounds and Reading Sounds Books (D, E, and F). The Recycling Book offers a refresher course of the skills taught in Reading I. Content organization for Reading II is shown below.

Book and Topic	Presentation Number
Recycling Book	
symbol-action games	1-6
rhyming	2-9
blending-spelling by sounds	6-16
blending-say it fast	1-10
sounds	1-63
reading sounds	11-63
take-home stories	11-63
Sounds and Reading Sounds	
sounds and reading sounds	160-340
Book D (160-220)	
Book E (221-280)	
Book F (281-340)	

Take-Homes are used every day. They are organized so that Take-Home Stories are presented in approximately two-thirds of the lessons. Most of the stories are divided into two parts with the Question Sheet used on the second day. A Read the Items exercise stressing comprehension skills, by having the children read directions and carrying out the directions, is used on days when stories are not scheduled. Worksheets and Writing Sheets are scheduled daily and can be used as seatwork and scheduled at a time other than the lesson presentation. The Worksheets increase in difficulty so that, at the end of Reading II, the children are reading passages of up to 170 words and answering six or seven questions based on the reading. The Writing Sheets extend the skills begun in Reading I to longer words and sentences.

Arithmetic I and II. Arithmetic I and II lessons focus on the following topics:

Arithmetic I

- matching
- rote counting
- rational counting
- symbol identification
- lines and numerals
- equality
- addition
- algebra addition
- facts of addition
- subtraction
- algebra subtraction

Arithmetic II

- revaluing
- analogies
- fact derivation and fact learning
- multiplication
- counting money
- negative numbers
- fractions
- problems in columns

The programs are organized into 220 lessons for level I and an additional 180 lessons (lessons 221-400) for level II. The arithmetic lessons are also planned for approximately 30 minutes. Children finishing level I before the end of the year continue on into the level II program.

The teacher's guide provides detailed instructions on the general teaching of the program as well as specific information on use of the presentation books, Take-Homes, and workbooks.

The Take-Homes for the arithmetic programs provide practice for the skills developed in the daily lessons and are taught as part of the arithmetic lesson. Before a particular task is presented in a Take-Home, the children have had approximately a week's work on similar problems.

In the Arithmetic II program workbook exercises are begun at lesson 231. The content of these exercises differs from the Take-Home material in that the tasks presented involve skills that the child has been working on for at least 20 days and, since the skills are not new, the children work on these on their own with minimum supervision and at a time other than the lesson period.

Format of Materials

The materials for the programs are packaged into kits for each level of each program. There are teacher kits and separate packages of material needed for students (10 sets per package).

The teacher kits contain lesson preparation materials such as teachers' guides, colored plastic group progress indicators, an acetate page protector, and specialized materials for the programs, such as decks of colored reading cards, language transparencies, geometric figure cards, and multiplication charts. They also contain the needed presentation books.

The teachers' guides for each program are published in the form of soft-covered booklets. The program presentation books, including the Language Color Book and Storybook, are hard-covered, spiral bound books. These books include all of the specific directions to the teacher for the lesson and indicate these directions by use of black type. The actual words that the teacher is to say are printed in color. For example, green is used in Language I and orange in Language II. Where needed, the desired responses of the children are shown in black italics. Among the instructions to the teacher is an indication of the specific activity or task to be taught from

that part of the presentation. The Language Storybooks and Color Book follow a similar color coding system, with teacher instructions, the words the teacher is to say, and the desirable student responses differentiated by color or typeface.

The student materials (packaged in sets of ten) contain the consumable materials needed for each Distar lesson. These include workbooks where appropriate, and Take-Homes (i.e., pages containing practice exercises and reinforcement materials). The Take-Homes are all printed on paper similar to newsprint. Workbooks are soft-covered. Instructions for presenting and using the Reading Take-Homes and Workbook appear in the teacher's guide. Instructions for the Language Take-Homes appear on the back of each Take-Home. Instructions for the Arithmetic Take-Homes and Workbook appear as part of the lesson in the presentation books.

In addition to the teacher kits and student materials, teacher training materials and supplementary student materials are available. Teacher training materials include soft-cover books such as the Distar Trainer's Manual and the Distar Participant's Manual. Supplementary materials for students include Distar and Strategy Games and a Distar Library Series of reading materials.

Cost of Materials to User

A price list of level I and II Reading, Language, and Arithmetic programs was published in the 1971 descriptive brochure of the Distar Instructional System and is summarized as follows (subject, of course, to future modification):

Item	List Price	Net Price
Distar Reading I		
Teacher Kit	$ 66.70	$ 50.00
Student Set of 10	90.00	67.00
Distar Reading II		
Teacher Kit	100.00	75.00
Student Set of 10	147.00	110.00
Distar Language I		
Teacher Kit	200.00	150.00
Student Set of 10	46.70	35.00

(continues on next page)

Item	List Price	Net Price
Distar Language II		
Teacher Kit	$200.00	$150.00
Student Set of 10	52.00	39.00
Distar Arithmetic I		
Teacher Kit	160.00	120.00
Student Set of 10	107.00	80.00
Distar Arithmetic II		
Teacher Kit	160.00	120.00
Student Set of 10	120.00	90.00

A two-day orientation session on the Distar Instructional System is provided by the publisher, SRA, at no cost to the user. For a fee, SRA will provide carefully designed instruction for specific client needs, which may cover in-depth studies of the different aspects of the instructional system with sufficient flexibility to suit the particular situation, interests and goals of the client.

Procedures for Using Product

Learner Activities

Since the objective of the Distar systems is to teach each child the skills he needs for success in school, the systems require 100% participation by each child and mastery of these skills at at least the prescribed level. The child will be participating in daily lessons approximately 30 minutes long for each Distar program which the class uses. This could be one Distar subject or all three.

When the child is participating in a Distar lesson, he will be in a small group of 10 students or less, of nearly the same performing level. The lessons commence with group activity which the teacher conducts. The lesson begins in the form of drill from the presentation books, the teacher making statements, asking a question, giving a signaling cue, and the children responding in unison and hopefully in an energetic and vigorous manner. Each child is expected to respond whether it be in the lesson drill, review material, or test material; and his response is carefully evaluated by the teacher. If errors or hesitancies are detected, the child or the group is taken carefully through immediate correction procedures. There is much repetition in the tasks

and questions to provide the reinforcement which the program authors stress. After group activity in the lesson, each child is called upon to respond to questions individually.

The child will also work with other materials such as the Storybook, Color Book, and Workbooks, where applicable during the lesson period. As the child advances in Arithmetic II and Reading II, workbook, worksheet, and writing sheet activities are rescheduled to another part of the day to be performed as individual seatwork with a minimum amount of teacher supervision.

During the last part of the 30-minute lesson period, the children will work on the Take-Homes which are given as rewards for working hard in the lesson sessions.

At times other than the lesson periods and the scheduled seatwork periods for the level II programs, the children may engage in other seatwork activities and games that reinforce the instruction of the group presentations. The type of activities suitable for reinforcing Distar skills during the early part of the first year is severely restricted because of the children's limited writing and reading skills, but the teacher can make up worksheets of sounds and numerals for the children to write and copy. Later she can make up games for the children to play, such as games requiring identification of sounds and words and other activities providing additional reinforcement of the lesson materials. Some time would also probably be spent in non-Distar activity.

The children are given liberal and immediate praise for correct responses. This is one of the main motivational techniques applied in the Distar system. Hard work during each lesson session is emphasized and rewards by praise and by distribution of the Take-Homes. If more tangible rewards seem to be required occasionally, rewards such as candy, raisins, colored stars, or handshakes may be used sparingly. In order to promote effective behavior in getting the children into their lesson presentation groups effectively and maintaining effective operation of the seatwork activities simultaneously, point systems may be set up for group competition, awarded on a group basis, with rewards in the form of special privileges, etc.

Teacher Activities

Correct teaching of the programmed materials is fundamental to the Distar system. Prior to teaching the program, the teacher may attend a two-day orientation and training session during which she will be shown the

teaching procedures and will be taught how to present the tasks in the sequenced instruction. Rationale and theory of the programming are not emphasized during the session because the program is considered to be complete and the teacher is to teach the materials without modifying or altering them. While the training session provides practice for the teacher, the teacher must spend time on her own practicing and perfecting the presentation and improving her ability to analyze the tasks.

Out-of-class preparation for the teacher is reduced since the usual lesson planning activities are eliminated by the form of the teaching materials. The teacher then is free to spend time perfecting presentation techniques and to devote more time to other teaching activities.

Prior to presenting Distar lessons, the teacher must group the children into small working groups of no more than five to ten members. The performing level of the children within the group should be as homogeneous as possible and initial grouping may be guided by performance on initial tests provided at the beginning of the programs. The high performers can be placed in groups of up to ten children, while the lower performers should never be placed in groups larger than five. Homogeneous grouping should be maintained throughout a program and the teacher should regroup the children whenever necessary to maintain homogeneity.

Children entering a program late should be given the various tests in the program materials and placed accordingly. If they do not fit in with the ongoing groups, the teacher should give them special tutorial help to bring them up to the level.

A teacher can teach three Distar subjects in a full day program if she has the assistance of an aide or a team arrangement with one or more other teachers. Without an aide, the teacher probably would be able to teach only two programs. In a half-day program an unaided teacher will probably teach one Distar program.

While the teacher is presenting a Distar program to one group, the other children will be engaging in other activities which the teacher must keep organized. If this activity can be shared by aides or other teachers, more time can be devoted to actual Distar teaching.

The actual teaching activities of the Distar programs are guided by the programs themselves, supplemented by appropriate additional reinforcing activities for seatwork activities. The teacher should not introduce extra materials into the lessons, improvise presentations, or vary the instructions.

Provisions for Parent/Community Involvement

The Distar system provides a means of keeping the parents informed about what the children are being taught on a daily basis. This is accomplished by the Take-Home materials which are awarded at the end of the lesson period. The child brings these materials home and will probably tell his family and friends about them, providing additional reinforcement of the skills and concepts developed in the lessons, as well as providing materials for the family to see.

Special Physical Facilities or Equipment

No special facilities or equipment are required to teach Distar programs; however, a chalkboard is used in the arithmetic programs. A record player is required for the teacher to hear the sound recordings of pronunciation and presentation techniques for Reading I. The following extra materials are needed, however, to teach Distar Language I and most likely would be readily available.

Two identical glasses (water to fill one)
Pencil and cup
Two rhythm sticks
Record player or musical instrument
Two cans, identical in size (hot water to fill one and cold water to fill the other)
Pieces of smooth paper and sandpaper, same size and color, to be pasted in the presentation book (several sets required for different lessons during the program)
Pieces of wood, same size and color, one rough and one smooth
Penny
Pieces of cloth, same size and color, one rough and one smooth, to be pasted in the presentation book (several sets required during the program)
Two toy cars
Two identical sealed shoeboxes, one filled with heavy stuff and the other filled with light stuff
Two identical coffee cans, one filled with heavy stuff, the other filled with light stuff
Two sets of two identical washcloths, one wet and one dry, in each set

Two pieces of the same kind of bread, one fresh and one stale
Salty crackers and sweet candy
Two identical bottles, one filled with ammonia and the other with cologne
Red, white, and yellow construction paper cards in sufficient quantity to give four of each color to each child in a group
Extra colored construction paper

Materials are also required for Language II as the program strongly stresses that children cannot learn about the nature of specific objects from a picture, but must have the opportunity to observe first hand. The required materials are the following:

Piece of wood
Piece of cloth
Brick
Plain piece of paper
Plain piece of cardboard
Piece of metal
Piece of leather
Piece of concrete
Several leather objects (strap, shoe, jacket, glove, etc.)
Several glass objects (dish, jar, glass, light bulb, etc.)
Several plastic objects (bottle, plastic container, spoon, etc.)
Several rubber objects (rubberband, hose, eraser, ball, etc.)
Several china objects (bowl, ashtray, cup, plate, etc.)
Knife with wooden handle and metal blade
Leather belt with a metal buckle
Rake with wooden handle and metal prongs
Wagon with metal body and rubber tires
Shovel with wooden handle and metal scoop
Hammer with wooden handle and metal head
Shoe with leather top and rubber sole
Purse with leather bag and metal clasp

Recommended Assessment Techniques for Users

In-program tests are incorporated into the presentation materials of the Distar programs and additional tests are not required during the programs. The in-program tests are designed to tell whether a group of children have mastered the given skills or whether additional work is needed before proceeding to more complex tasks or whether a group which is progressing satisfactorily can be accelerated.

Specific instructions and the criterion for passing are included in the tests. Tests are given individually and the results should be carefully regarded since children who are permitted to proceed on to more complex

tasks and skills will have more trouble in learning the new ones if they have not mastered previous skills.

The teacher will have a rough assessment of her progress by the rate in which the lessons are taught. The rate is dependent on the children's progress, which in turn is governed by the children's performance on the tests and whether an unusual amount of repetition is required.

If the teacher is teaching the materials in a satisfactory manner, at least one-third of beginning kindergarten children should complete the first level of the program they are using. One-half of first grade children should complete a first level program in one year. This progress assumes daily lesson presentation. If this level is not achieved, the teacher is probably not teaching properly or else is not presenting lessons every day.

ORIGINS

Key Personnel

Siegfried Engelmann, an associate professor of special education at the University of Oregon, originated and continues to direct authorship of the program. Engelmann has been the driving force behind the program from its beginning in 1964. Carl Bereiter, a former professor of special education at the University of Illinois and now at the Ontario Institute for Studies in Education, was the co-originator with Engelmann of the teaching method used in the program. He assumed many of the administrative duties as well as concerning himself with the research aspect of the methodology. Wes Becker, a former professor of education at the University of Illinois and now a professor of special education at the University of Oregon, joined with Engelmann in 1968. He contributed greatly to the project as the director of the Engelmann-Becker Follow-Through project and the co-founder of the Engelmann-Becker Corporation.

Engelmann and Bereiter developed the methodology of direct instruction that forms the basis of preliminary materials that Engelmann developed and tested. Then SRA in 1967 contracted with Engelmann and his co-authors, Jean Osborn, Elaine Bruner, Doug Carnine and Therese Engelmann, to develop materials based on this methodology. SRA named these materials the DISTAR Instructional System, field tested them, and published them.

The staff of Science Research Associates, Inc., as well as many other educators, administrators and teachers, have contributed significantly to program development and have participated in tryouts and implementation of the program in the classrooms.

Sources and Evolution of Ideas for Product

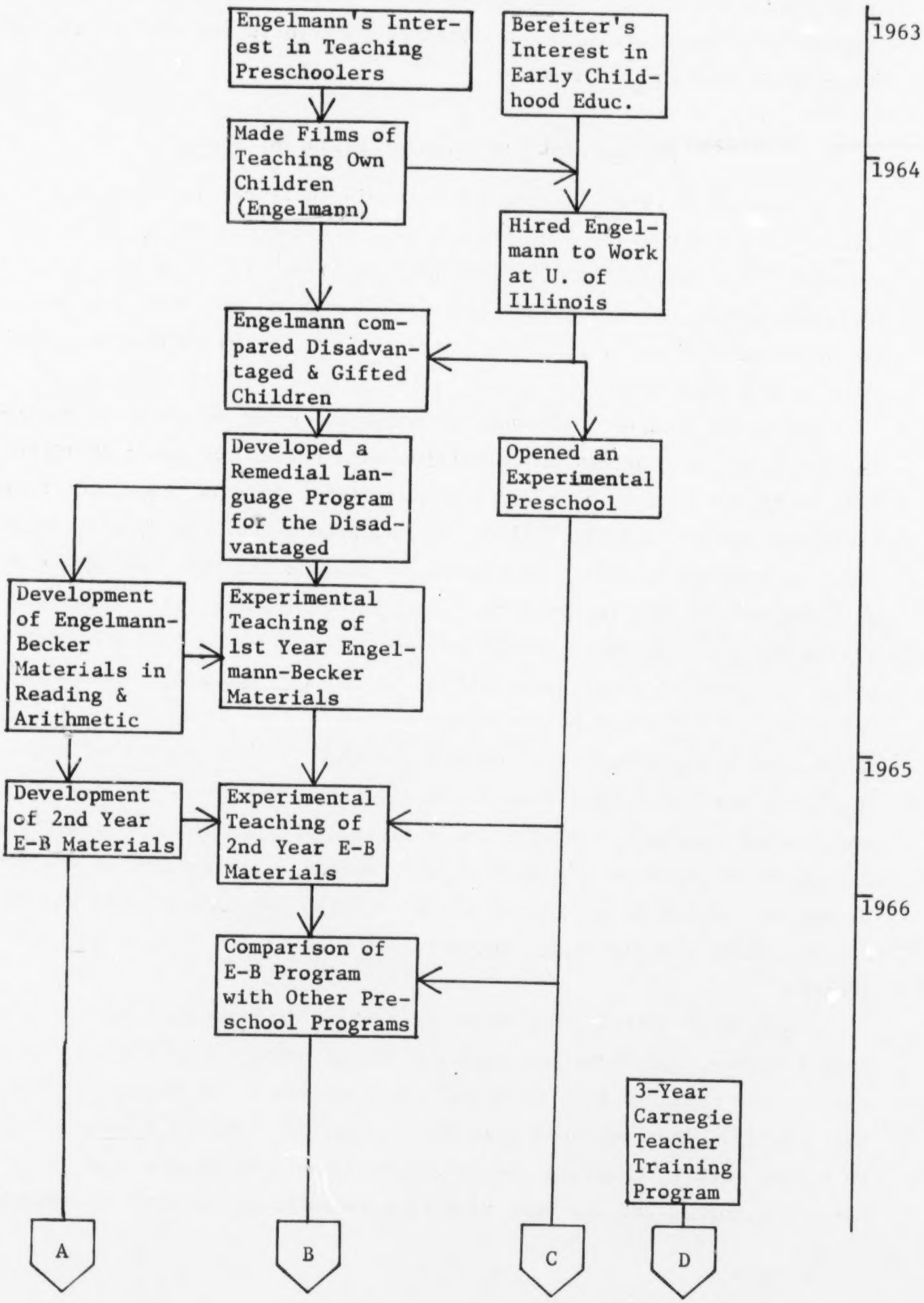
In the early 1960's, there was a growing national interest and concern over the large number of school failures, particularly among children from socially and economically disadvantaged families. Educators and psychologists advocated better materials and strategies for early childhood education and the importance of early intervention to prevent the disadvantaged children from failing in school.

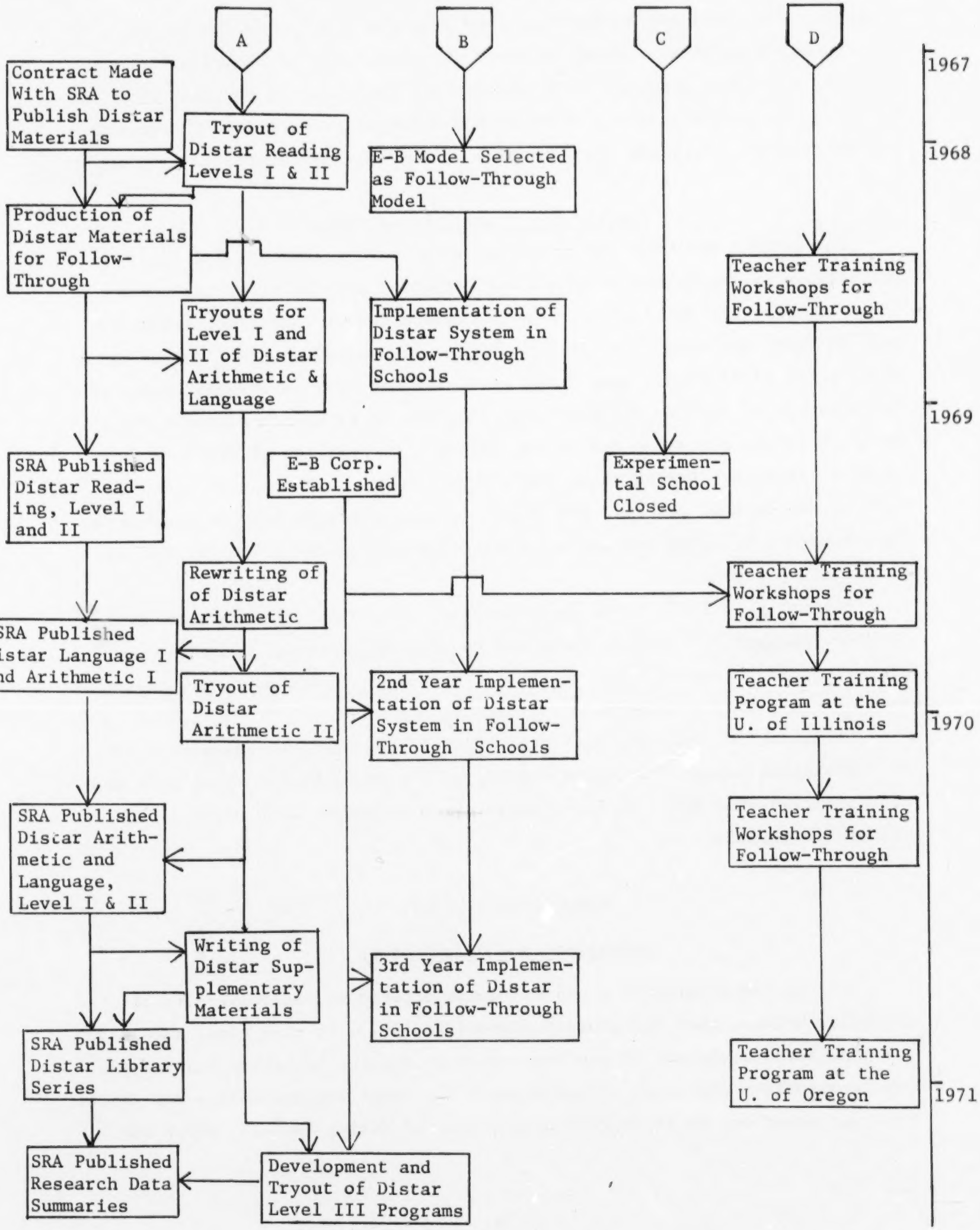
Engelmann studied philosophy in college. Prior to 1963, he was in marketing, working mainly on television commercials for young children. When trying to develop an effective advertising program, Engelmann researched available educational material on how children learn. As he was unable to find any related material, he started to develop his own. Using his own children to test his teaching theories, he developed a film to demonstrate his ideas. Carl Bereiter at the University of Illinois Institute for Exceptional Children, who was doing his own studies on teaching disadvantaged children, was impressed by Engelmann and hired him. (See Figure 1 for the major events, beginning with these just noted, in the history of the system.) Engelmann spent his first summer (1964) at the Institute for Research on Exceptional Children comparing the abilities of disadvantaged preschoolers and gifted children of Illinois faculty members. By the end of the summer, he and Carl Bereiter had worked out a remedial language program for the educationally disadvantaged, which laid the basis for much of the Distar program.

Instead of starting out with any particular learning theory or developmental theory, Engelmann and Bereiter simply asked themselves two questions: What do the children need to learn? And how can it be taught to them most efficiently? They believed that every child can learn the basic skills to do school work if they are taught properly. Following the lead of Robert Gagne who emphasized the need to define educational objectives through task

Figure 1

Major Event Flow Chart


Engelmann's Interest in Teaching Preschoolers
Bereiter's Interest in Early Childhood Educ.
1963
Made Films of Teaching Own Children (Engelmann)
1964
Hired Engelmann to Work at U. of Illinois
Engelmann compared Disadvantaged & Gifted Children
Developed a Remedial Language Program for the Disadvantaged
Opened an Experimental Preschool
Development of Engelmann-Becker Materials in Reading & Arithmetic
Experimental Teaching of 1st Year Engelmann-Becker Materials
1965
Development of 2nd Year E-B Materials
Experimental Teaching of 2nd Year E-B Materials
1966
Comparison of E-B Program with Other Preschool Programs
3-Year Carnegie Teacher Training Program
A
B
C
D


A
B
C
D
1967
1968
1969
1970
1971
Contract Made With SRA to Publish Distar Materials
Tryout of Distar Reading Levels I & II
E-B Model Selected as Follow-Through Model
Production of Distar Materials for Follow-Through
Tryouts for Level I and II of Distar Arithmetic & Language
Implementation of Distar System in Follow-Through Schools
Experimental School Closed
Teacher Training Workshops for Follow-Through
SRA Published Distar Reading, Level I and II
E-B Corp. Established
Rewriting of of Distar Arithmetic
Teacher Training Workshops for Follow-Through
SRA Published Distar Language I and Arithmetic I
Tryout of Distar Arithmetic II
2nd Year Implementation of Distar System in Follow-Through Schools
Teacher Training Program at the U. of Illinois
SRA Published Distar Arithmetic and Language, Level I & II
Writing of Distar Supplementary Materials
3rd Year Implementation of Distar in Follow-Through Schools
Teacher Training Workshops for Follow-Through
SRA Published Distar Library Series
Teacher Training Program at the U. of Oregon
SRA Published Research Data Summaries
Development and Tryout of Distar Level III Programs

analysis, Engelmann and Bereiter studied what was lacking in the language of disadvantaged children. Based on their findings, they developed a language program, and later programs in arithmetic and reading. In November 1964, an experimental preschool was started at the University to try out the materials and strategies. This was the beginning of the Engelmann-Bereiter program.

Funding for Product Development

The initial work for the prototype which laid groundwork for the methodology of the Distar programs was supported for the first two years (1964-1966) by the Bereiter grant on "Acceleration of Intellectual Development in Early Childhood" by the U.S. Office of Education. For the following three years (1966-1969), some funds were provided by a three-year Office of Education grant for the University of Illinois to establish a center for early childhood education and by the Carnegie Corporation of New York for teacher training. During these years there was no real money to spend for product development per se. The annual operating budget for the program was approximately $140,000 and the Carnegie teacher training grant was $60,000 to $70,000 per year.

Beginning in 1967, funds (approximately $30,000/year) were provided by Science Research Associates, Inc., for developing, writing, and trying out Distar reading, language, and arithmetic materials, based on contracts with Engelmann and the co-authors.

Beginning in 1968, the national Follow-Through project has been a source of operational funds. The operating budget for the 1969-70 school year was approximately $900,000. Follow-Through funds, however, were not used for product development.

PRODUCT DEVELOPMENT

Management and Organization

The Engelmann-Bereiter group was headquartered at the University of Illinois, Urbana, when the program started in 1964. At that time, Engelmann was a research assistant in the Department of Special Education and Bereiter was an associate professor of education. The first Engelmann-Bereiter prototype was tried out in an experimental preschool during 1964-65, which was

part of a two-year comparative study of five different preschool intervention programs at the University.

In the fall of 1966 the preschool and kindergarten moved into Colonel Wolfe School, a former elementary school in Champaign, then being used for several experimental preschool programs. Engelmann taught in the experimental preschool and continued to work on curriculum development, while Bereiter supervised the project. In the summer of 1967 Bereiter left the University of Illinois and Earnest Washington, an assistant professor at the University, acted as project director during 1967-68.

In 1967 Engelmann and several of his colleagues contracted with SRA to develop and write programs and materials for the Distar Instructional System, which were to be based on the methodology Engelmann had helped develop. There were three programs involved: reading, arithmetic, and language. Engelmann and Elaine Bruner worked on the reading program; Engelmann and Doug Carnine worked on the arithmetic program; and Engelmann and Jean Osborn worked on the language program. Tryout of the first version of an actual Distar program began with Reading I in the fall of 1967, under the mutual direction of SRA and Engelmann and the co-authors. Similar tryout of field test versions of the Distar Arithmetic I and Distar Language I programs began in 1968.

In the spring of 1968 Engelmann was invited to become a Follow-Through Project model sponsor. Wesley Becker, a professor of Educational Psychology at the University, joined with Engelmann as project director. Jessica Daniels handled administrative details for the Follow-Through sites as well as for the experimental kindergarten still in the operation. This school was closed in June of 1969.

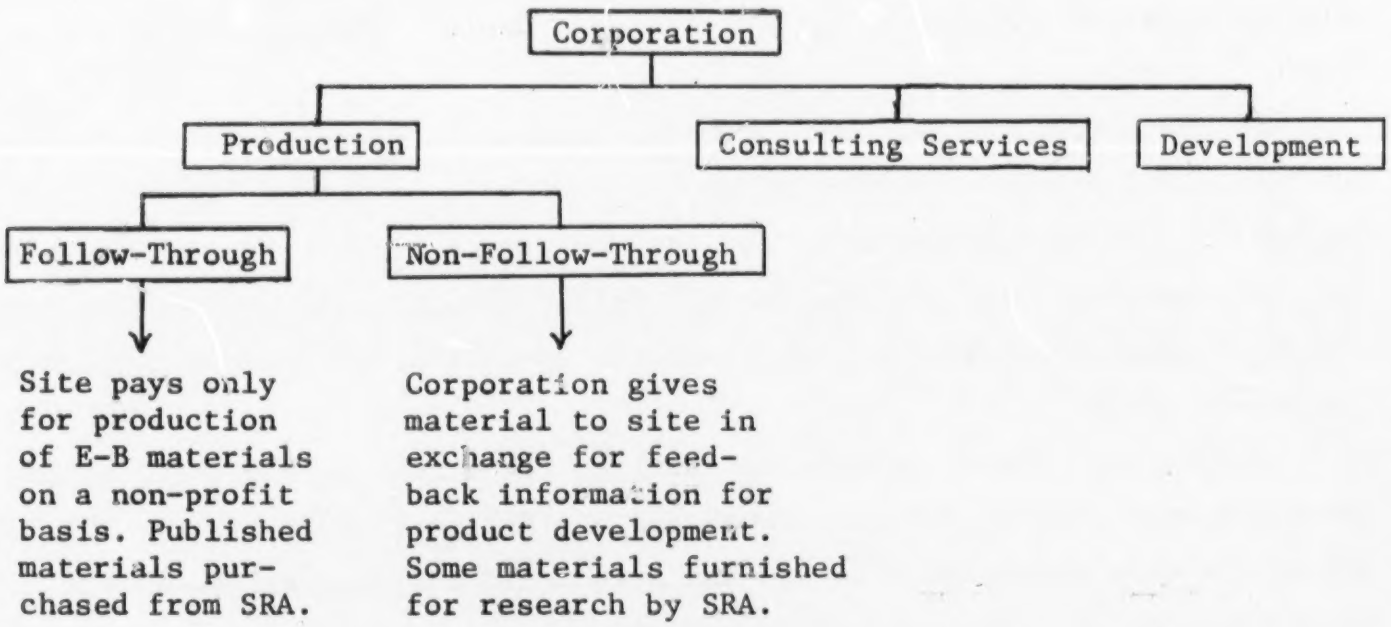
During the 1968-69 school year revised field test versions of the Distar programs were used by Follow-Through and non-Follow-Through sites. Reading materials were purchased from SRA and arithmetic and language materials from Engelmann, et al. In some instances materials were provided without charge to non-Follow-Through schools in exchange for feedback information for future revision and product development.

The Engelmann-Becker Corporation, a private non-profit organization, was established in spring of 1969 to handle the problems related to the

teacher training for the Engelmann-Becker instructional model and the production of the Engelmann-Becker materials for Follow-Through sites. In the summer of 1970 the Corporation and the Engelmann-Becker Follow-Through program moved from the University of Illinois to the University of Oregon. At the University of Oregon the Engelmann-Becker program is part of the Department of Special Education. The function of the program is to administer the Follow-Through project, monitor the Follow-Through sites, and conduct teacher training programs and research. Although developmental work in a number of areas continues at the Engelmann-Becker Corporation, the product development for the Distar Instructional System *per se* is performed under contract between SRA and the individual authors involved. Arrangements between these authors and the Corporation have been made for some production and product tryout functions.

At present organization of the Engelmann-Becker Corporation is shown below.

Organization of the Engelmann-Becker Corporation


Corporation
Production
Consulting Services
Development
Follow-Through
Non-Follow-Through
Site pays only for production of E-B materials on a non-profit basis. Published materials purchased from SRA.
Corporation gives material to site in exchange for feedback information for product development. Some materials furnished for research by SRA.

Original Development Plan

As originally stated in the summer of 1964, the Engelmann program was a small scale study designed to explore more effective ways of teaching disadvantaged preschool children. There was no specific plan or proposed schedule for developing the product.

The development of the Distar programs actually came about as a sop for teacher training. After the developer's experience with the Carnegie Graduate training program, they realized that it would be not only difficult, but nearly impossible to reach all of the teachers who need help and to train them effectively. The cost of such training would have been outrageous. They therefore tried to develop programs that held some of the teaching variables constant. They tried to provide the teacher with clear examples and clear statements (ones that the children either would understand or could be taught). They tried to take great aspects of the "lesson planning" out of the teacher's hands. And they tried to arrange a lesson so that a number of activities were being presented on a single day. But the impetus for the programs came from the realization that there was no way to change colleges of education so that they provide quality teacher training and no practical way to reach the thousands of teachers in the field with effective training so that they could "do it on their own."

The general instructional strategy followed in all three subject areas was that of rule followed by application. A verbal formula was first learned by rote and then applied to a graduated series of analogous examples of increasing difficulty. The conventions for constructing the program were as follows:

1. The objectives must be stated as a series of specific tasks which are capable of determinng whether the child has mastered the desired learning.

2. Everything that follows--the analysis, the development of specific teaching presentations, and the teacher's behavior--derive from the objective tasks.

3. The analysis is conducted by noting every concept that is used in the objective problems.

4. Tasks that are to be used to teach these concepts must be specified.

5. The presentation of tasks for a given concept must be sufficient, that is, it must admit to one and only one interpretation.

6. For clarity and maximum informational feedback from the performance of children, the program should be designed so that the child learns one new concept at a time.

7. The teacher must infer concept mastery of the children from their performance; she must provide appropriate remedies for children who have developed misconceptions or inadequate formulations of a given concept. She must recognize that she deals only in concepts and that the child's responses must be interpreted in terms of concepts.

8. The program must be evaluated in terms of whether or not the children reach the various criteria of performance specified by the objective problems and the tasks that derived from them.

Modifications of Original Development Plan

The original major objective of the program and the basic strategy for organizing and developing the curricula in language, arithmetic, and reading remained relatively constant. However, some modifications were made. First, the basic concepts or "tasks" to be included in the program were constantly changed as "tasks" were added, modified, and dropped, and a better strategy for teaching certain concepts and their desired sequence became more clear. The program was originally intended to develop a program for disadvantaged preschool children, but later the developers adapted the program for use with all types of preschoolers and with children in the primary grades.

Actual Procedures for Product Development

Development

The initial development of the prototypes was begun in the fall of 1964. However, from 1964-67, there was no attempt to develop a "Distar" program. All of the materials that were developed during this period were to be used in the experimental classroom and were not planned for publication. The developers' concerns during this period were to develop effective teaching demonstrations. Later (in 1967), they began the task of translating what they had done into the format of a publishable program.

The unit of each program (i.e., language, arithmetic, and reading) was the "basic concept" in the area. Engelmann and his staff discussed ideas for units and translated them into "tasks" and lessons. The following general procedures were followed:

1. Engelmann and staff drafted versions of several concepts, including design of a teaching strategy and materials.

2. The draft lessons underwent exploratory teaching at the experimental school.

3. On the basis of feedback from the teachers, Engelmann and his staff prepared revised lessons.

4. These revised lessons were tried out to correct problems and modifications were made. This revision process was repeated as necessary.

5. The whole package was completely revised to produce a preliminary version of the program for publication.

6. The preliminary program was tried out again and revised for commercial publication.

During these revision processes, more weight was given to the comments of the project manager or a proven teacher than to those of the less experienced teacher. At the beginning of the program, only a few units or lessons were sent out at a time in case extensive revisions might be required.

The general principles for preparation of program materials were:

1. Sequence materials to counteract most of the more serious errors teachers commonly make.

2. Provide teachers with specific instructions.

3. Sequence temporally so the teachers can get through the materials.

4. Teach only one thing within a given task.

5. Do not introduce new tasks in less than three days.

6. Use a great many examples for the more disadvantaged children.

Levels I and II of the Distar Reading program were written in 1967 for an SRA field test. A revised form of Reading I was used during the 1968-69 school year by Follow-Through and by other field test sites. The final version of Distar Reading I was published by SRA in the spring of 1969 and the final version of Reading II was published by SRA in the fall of 1969.

During these stages, the physical format of the present format and the special Distar Font for Reading I were designed by SRA. The general

specifications established for the Reading program were also followed in the Arithmetic and Language programs.

Field test versions of the Distar Arithmetic and Language programs were tried out in 1968. Based on field test feedback they were revised and published by SRA in the fall of 1969. The level II Arithmetic and Language programs were tried out and revised between 1968 and 1970. Distar Arithmetic level II and Distar Language level II were published by SRA in the fall of 1970.

Preliminary versions of the level III programs were field tested during 1970 and 1971. Both the authors and SRA have sponsored further tryout of these materials. Current publication plans are for the Distar level III programs in Reading, Language, and Arithmetic to become commercially available during the 1972-73 school year.

Formative Evaluation

The formative evaluation activities for the programs typically moved from the initial testing of the exploratory version by teachers to revision of the materials, retrial of the revised materials, and final revision based on the feedback from the field tryouts before commercial publication. Although the level I and level II programs are now available commercially, the Engelmann-Becker Corporation and SRA continue to obtain additional feedback from the program users to improve the materials.

At the beginning of the Engelmann program, the evaluation of the program was informal, such as discussions with teachers and staff regarding the difficulties associated with particular lessons. During the 1967-68 school year, a more intensive attempt at developing systematic procedures for program evaluation and revision was conducted. This study of the "trouble shooting" program revisions was still primarily informal, but had some formal components. This effort will be described below because it summarizes, in general, the procedures used in the formative evaluation of the prototype materials before they were field tested on the Follow-Through sites.

The informal evaluation consisted primarily of "brain storming" sessions in which the teachers compared observations on the relative difficulties of particular tasks included in the program. The teachers were not primarily responsible for making curricula changes, but were merely asked to note problem spots. A curriculum writer then made changes that were designed

to remedy the situation. He made changes either by (1) lengthening the sequence and breaking it into small steps that were to be distributed over a longer period of time, or (2) developing a new method of demonstrating the concept. Whether or not the change was effective was determined on an "eyeball" basis. The variation in performance between the top performing children and the lower performing children was used as the basis for evaluating the effectiveness of a given change. The formal procedure consisted of "criterion testing," which provided a model for more effective appraisals of curriculum and specific clues about how to change troublesome parts of the program. Changes were made in all three curricula areas. Most of the changes were extremely specific; however, some of them proved to be rather extensive. Each of the reading, arithmetic, and language programs were then field tested on Follow-Through sites and final revisions were made before commercial publication.

SUMMATIVE EVALUATION

Siegfried Engelmann and the other authors conducted several summative evaluations of the prototype programs. Other evaluations have been conducted by users of the programs, and still others have been conducted by the publisher, Science Research Associates, Inc. All of these types of evaluation have been included in the summary documentations prepared by SRA. The evaluations by the authors involved in the development of the program will be described first, followed by evaluations summarized by users, and then some of the evaluations documented by the research staff of SRA.

Findings by Those Involved in Distar Development

The early versions of the Distar programs were used successfully with children at the University of Illinois in Champaign. Evaluation data are available for three groups: one starting in 1964, one starting in 1965, and one starting in 1966. Each of these three groups of approximately 15-20 children received the treatment for two years prior to their entrance into the first grade. All three made significant gains in the Stanford-Binet test after one year in the program. The first and second groups maintained the IQ gain or increased after the second year in the program. Evidence on the third group for the second year treatment is not reported yet. Since the evaluation designs are almost the same for three groups and a comparison

group is available only for the second group, only the evaluation study of this second group (1965-67) will be described in Study 1.

Study 1

This study was based on two assumptions: (1) a child who achieves well on an intelligence test or a more specific test of academic achievement has been taught the skills that are being tested, and (2) if children can learn at an above normal rate during two years of intensive preschool instruction, their performance will not drop during the second year of instruction as is commonly the case in traditional nursery schools.

The subjects of the experiment were children who met the following selection criteria:

1. According to Warner ratings of occupations and housing ratios obtained through the City Planning Commissioner's office, subjects were from low socioeconomic homes.

2. Subjects were 4 years old by December 1, in keeping with public school entrance policies.

3. Subjects did not have previous preschool experience.

4. Children with gross physical handicaps or severe retardation were excluded.

The children who qualified for the program according to the above criteria were administered the Stanford-Binet tests and were divided into three groups: high intelligence, middle intelligence, and low intelligence. They were then assigned to an experimental or comparison group with each group receiving the same proportion of highs, middles, and lows. Adjustments were made to balance the numbers of Negroes and whites, males and females in each group; 15 children were assigned to the experimental class and 28 to the comparison class.

The subjects in the comparison group received one year of traditional preschool education and one year of public school kindergarten. During the first year, they attended a 2-hour-a-day preschool based as closely as possible on the recommendations of child development authorities.

The experimental children were enrolled in the academic preschool for two years prior to their entering first grade. They received two hours of instruction daily. The curriculum emphasis was on rapid attainment of basic academic concepts using a prototype version of the programs that eventually became the Distar programs.

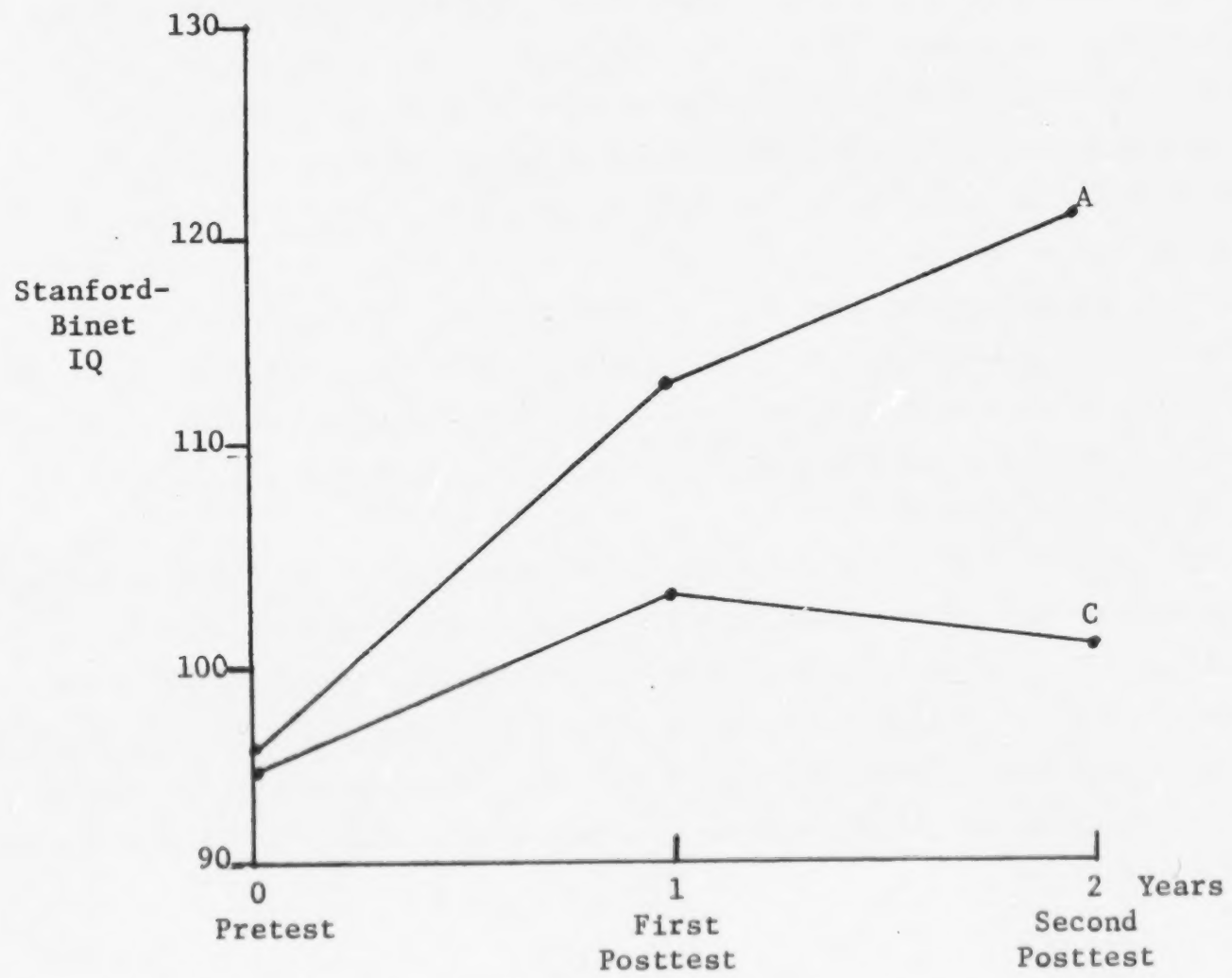
The Stanford-Binet Intelligence Test and Wide Range Achievement Tests in reading, arithmetic, and spelling were administered during the course of the two year program. Both the experimental and control groups received the Binet IQ test three times--once in the fall of 1965, again in the spring of 1966, and finally in the spring of 1967. The experimental group also received the Wide Range Achievement Test Battery in the spring of 1967--this was prior to their entrance into the first grade of public school.

The experimental group achieved significantly greater Stanford-Binet IQ gains than the subjects in the comparison program, both at the end of the first and second years of instruction. Figure 2 illustrates the mean gains made by each group over the two year period. The comparison group showed an 8.07 gain after the first year of instruction, but had a loss of 2.96 points after the second year. The experimental group showed a 17.4 gain after the first year and an 8.6 gain after the second year ($p=.02$ for Year 1, .001 for Year 2).

The experimental group achieved at the second-grade level in both reading and arithmetic before entering into the first grade of public school. Also, according to the investigators, the most noticeable characteristic of the children after two years of instruction was their confidence in their abilities to meet a challenge. Interviews with the parents and observations of the children disclose no ill effects as a result of the highly structured formal instruction.

Figure 2

Stanford-Binet IQ Scores for Experimental and Control Groups in the Academic Preschool Program, 1965-67



A Experimental Group
C Control Group

Study 2

Results of a series of studies formulated to measure the effect of five different preschool programs on children from educationally and economically deprived families have been reported by Merle B. Karnes, Audrey S. Hodgins, and James A. Teska of the University of Illinois. Included in the comparison were children who had two years of instruction in the "Direct Verbal Program" which was a preliminary version of the Distar programs.

The subjects were children from families judged by public aid and school authorities to be educationally and economically deprived. The initial group consisted of 75 children in three programs. During the second year of the study, 45 more children were included, 30 of whom entered classes with two additional programs. At the beginning of the study, the mean Stanford-Binet IQ of the groups was from 93 to 96. Each class had 15 children and met daily during the school year, in sessions lasting approximately 2 hours and 15 minutes.

The five programs were: (a) Traditional Program, (b) Ameliorative Program based on stimulation of verbalization in conjunction with the manipulation of concrete materials to establish new language responses, (c) Direct Verbal Program, (d) Community-Integrated Program which was added to the study in the second year and offered a traditional program, but the structure of the class was much different, and (e) Montessori Program which was added in the second year. The five programs were chosen to represent levels of structure along a continuum from the traditional nursery school to a highly structured preschool.

Various test data were collected prior to preschool and at the end of the preschool year, the kindergarten year, and the first grade year.

At the end of the preschool year, all the children in the Ameliorative and Direct Verbal programs achieved a substantial IQ gain on the Stanford-Binet test. In the other groups, there were more modest average gains, and some of the children regressed. There were no significant differences among the group performance on the Peabody Picture Vocabulary Test. The group in the Ameliorative Program performed significantly better on the Frostig Test than the other groups.

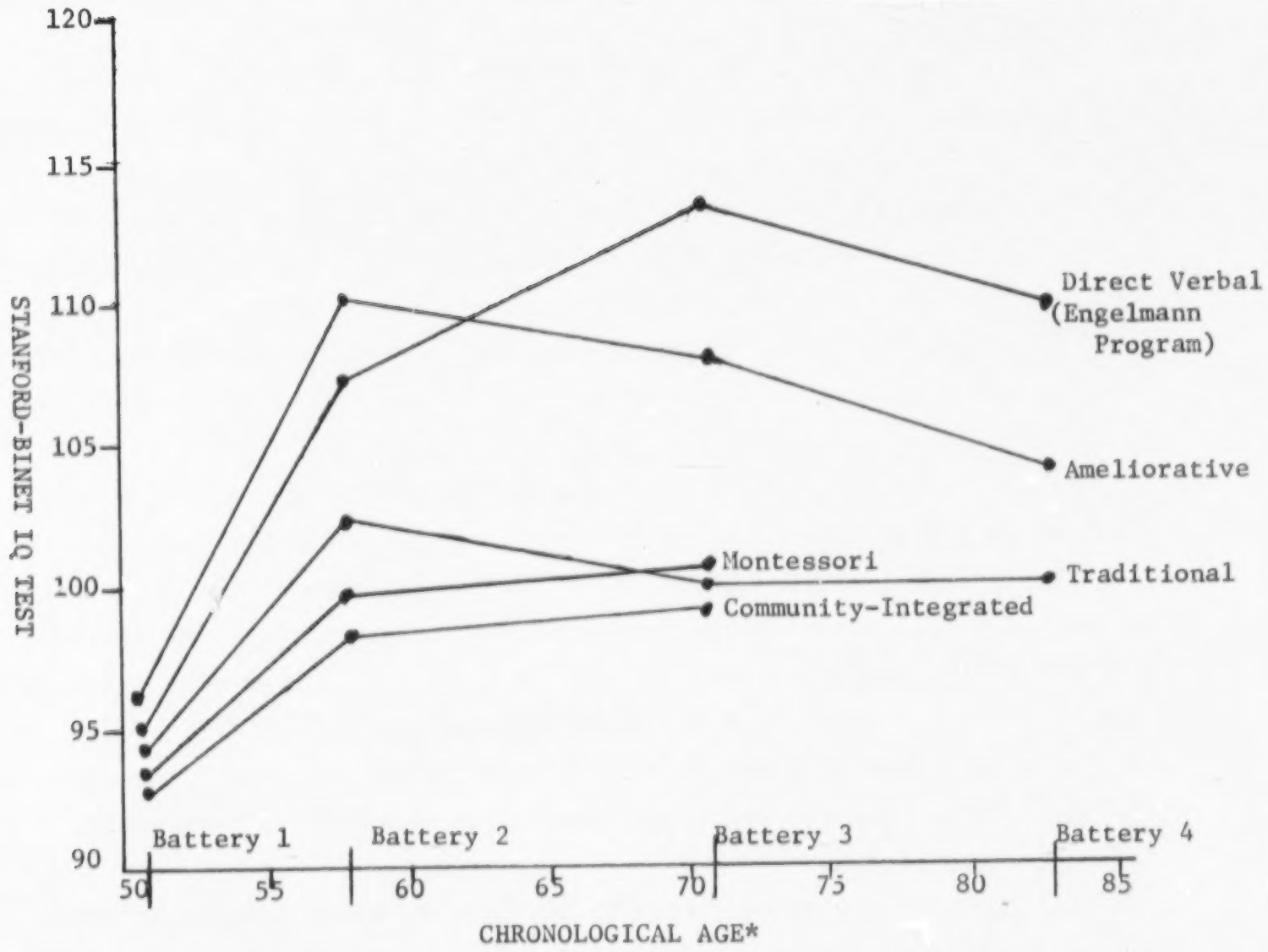
All the children except those in the Direct Verbal Program attended public kindergarten. The Direct Verbal group attended a half-day program

at the research center which was a direct continuation of their preschool curriculum. Those in the Ameliorative Program attended an hour-long session at the research center in addition to their regular kindergarten class.

At the end of the kindergarten year, only the Direct Verbal group continued to make substantial gains in IQ during their second year of schooling. The groups in public school maintained or slightly regressed in the gains made in the previous year as shown in Figure 3. One year of preschool experience, no matter how immediately effective, did not equip disadvantaged children to maintain performance in the kindergarten setting.

Figure 3

Scores on the Stanford-Binet IQ Test Given to Five Groups of Children Taught in Programs of Different Orientations



*The times of the batteries were plotted at the mean Binet chronological age of the groups.

Three of the groups were traced through the first grade of public school. Both the Ameliorative and Direct Verbal groups surpassed the Traditional group in reading and arithmetic achievement measured by the California Achievement Tests. The Stanford-Binet scores of all three groups showed no significant differences. All three groups made progress on the Frostig visual perception test. No intervention program was entirely successful in providing the impetus necessary to sustain at the end of the first grade the gains in intellectual functioning and language development made during the preschool years. However, serious learning deficits of the disadvantaged children in the Ameliorative and Direct Verbal groups were eliminated during the preschool years.

Other Summative Evaluations

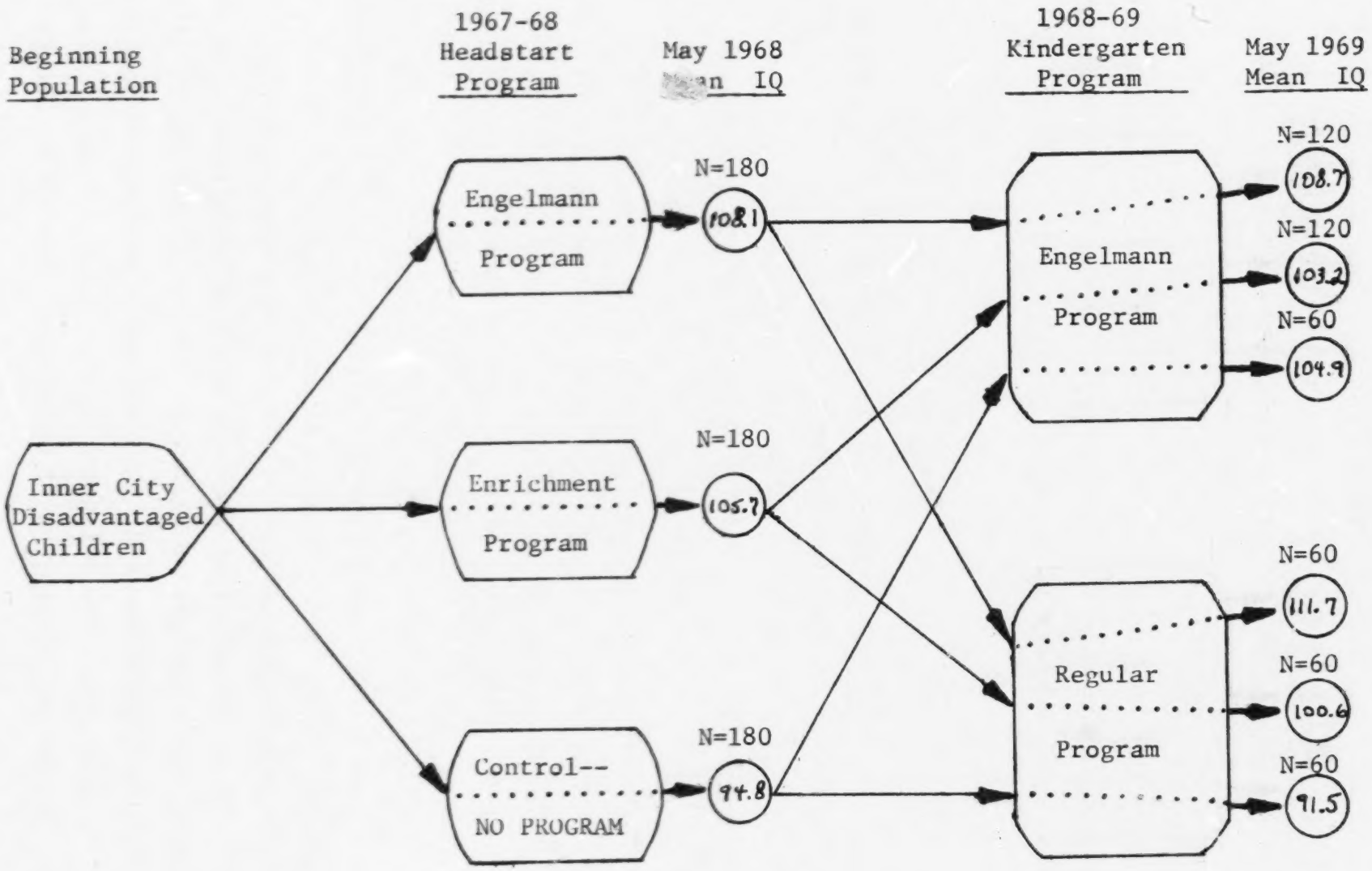
The early versions of the Distar programs have been used in research to evaluate relative effectiveness of various preschool programs by investigators who are not related to the developmental work of the Distar system. Two of these studies will be described.

Study 1

In Grand Rapids, Michigan, a city of about 200,000 people, Dr. Erickson and his associates conducted a study to investigate the effects of teacher attitudes and curriculum structure on preschool disadvantaged children. This study was part of an evaluation of the results of a Head Start project funded by the Office of Economic Opportunity. From a census pool of approximately 1,000 disadvantaged children in the inner-city, three groups of 180 children each were selected and randomly assigned to the two experimental prekindergarten programs and a control group during the 1967-68 school year. The two experimental programs were: (1) the Engelmann program and (2) an environmental enrichment program that stressed group orientation, field trips, and the like. During the kindergarten year (the 1968-69 school year), part of each of the three initial groups went into the Engelmann program in kindergarten and the other part went into a regular kindergarten. Figure 4 illustrates the overall design for assignment of children during the entire period of the study.

Figure 4

Student Assignment and Stanford-Binet IQ Means in a Two-Year Head Start Evaluation



At the end of the prekindergarten year, the score on the Stanford-Binet test for students in both experimental programs were quite high in relation to the control group. The mean IQ of the Engelmann preschoolers was 108., while the enrichment preschoolers had a mean IQ of 105.7 and the control group had a mean IQ of 94.8.

Significant changes in average IQ also resulted from the kindergarten experiences. Children in the regular kindergarten from the Engelmann pre-kindergarten program were approximately one full year above the norm (IQ=111.7); children in the regular kindergarten from the enrichment program were approximately at age level (IQ=100.6); and those children in the regular kindergarten from the control group were about one full year below the norm (IQ=91.5).

Children in the Engelmann kindergarten from the enrichment prekindergarten program and from the control group (no prekindergarten program) were able to score slightly above the age level (IQ=103.2 and 104.2, respectively), while children in the Engelmann kindergarten from the Engelmann prekindergarten program scored about one year above the age level (IQ=108.7). This indicates that the IQ levels attained by children who had been in the Engelmann pre-kindergarten were maintained in both the regular and Engelmann kindergarten classes. It also indicates that children who were not in any prekindergarten program did much better in the Engelmann kindergarten than the regular kindergarten.

By using such measures as behavioral observations, teacher ratings, and attendance patterns in the regular program, it was determined that children from the Engelmann prekindergarten program were better adjusted than children from the enrichment preschool or the control group.

Study

In Ypsilanti, a city of approximately 25,000 in southeastern Michigan, a Preschool Curriculum Demonstration Project was established in the public schools in the fall of 1968. This project was designed to evaluate three curriculum programs that were thought to have remedial potential for disadvantaged children. The results of the study were reported by Dr. David P. Weikart, Director of Research and Development for the Ypsilanti Public Schools.

The subjects in the study were drawn from the total available population of three- and four-year-old functionally retarded disadvantaged children in

the school district. There were three treatment groups (16 children each), one for each of the curriculum models studies, and one no-treatment group (n=28). The three curriculum models were: (1) Unit-Based Curriculum which emphasized unit teaching of general concepts and attention to the social and emotional development goals of traditional nursery schools; (2) Cognitive Oriented Curriculum which was developed by the Ypsilanti Perry Preschool Project using principles derived from Piaget's theories of intellectual development; and (3) Language Training Curriculum which was a preliminary version of the Distar programs. Teachers in the study were assigned to the programs after they had expressed a preference for one of the curriculum models. There were two teachers for each program, and the teachers followed carefully planned daily procedures which they designed to achieve the goals of their own curricula.

Stanford-Binet IQ pretest and posttest scores were obtained from the three treatment groups and the non-treatment group. The results are shown in Table 1.

Table 1

Stanford-Binet Scores for Functionally Retarded Disadvantaged Children Before and After Three Curriculum Treatments

	3-Year-Old				4-Year-Old			
	Pretest		Posttest		Pretest		Posttest	
Treatment	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Unit	73.6	6.9	101.1	7.1	76.4	4.6	94.1	2.4
Cognitive	82.7	5.3	110.7	12.3	75.3	6.1	98.6	12.8
Language	84.4	3.1	114.6	6.1	73.9	5.3	98.2	9.4
Control	80.8	2.9	81.2	10.1	80.8	2.9	84.1	9.7

All three treatment groups showed significantly higher gains than the non-treatment group, but no significant differences in gain scores were found among the treatment groups.

The teachers in each of the three programs rated their students on two scales--a Pupil Behavior Inventory and the Ypsilanti Rating Scale. These instruments were designed to reflect factors such as independence, academic

competence, and emotional adjustment. Children in each of the three programs were seen by their teachers as being much the same in terms of those factors.

SRA Documented Findings

Science Research Associates, Inc., the commercial publisher of the Distar Instructional System, collects test data from school districts where the programs have been used and reports objectively on the results of data analyses. In addition to publishing summaries of each individual case study, SRA has made available (November 1971) a booklet summarizing the first 21 case studies of the Distar Instructional System. These report not only the evaluations of authors associated with Distar development, but studies conducted by independent researchers and studies sponsored by SRA. The following are summaries of such reports.

Stockton, California

During the 1968-69 school year, the Distar Instructional System was used in one school in Stockton, California, a city of approximately 100,000 people. The school participating in the study had 51% Negro students, 1% other non-white students, 28% Spanish-surnamed students, and 18% white students. All the first grade students used the Distar program. About 51% of the families were at poverty level.

Many new practices were introduced that year through the Distar programs. In the kindergarten and first grade programs the school provided reading specialists, available every day, who concentrated on helping the students and teachers. A "pull out" system was devised to give individual students help precisely where and when they needed it. Students who needed help were pulled out of other activities and the specialists gave them individual attention. Also, class organization differed from previous years, and schedules were arranged so that there was a staggered reading program. In addition to the scheduling which allowed for smaller class size during reading instruction, federal aid money made it possible to have additional personnel, such as teacher aides.

Data were obtained from the tests administered for the California State testing program, which used the Stanford Achievement Test in Reading at the end of the first grade. The results for the 1968-69 year were obtained

after the three Distar programs (reading, language, and arithmetic) had been used for the full year in a field test edition. Results for the previous year (1967-68) were obtained after students used basal texts using a variety of approaches to reading instruction.

A considerable difference between first grade results for the year the Distar programs were used and the preceding year's results is apparent, as shown in Table 1. The difference of 10.67 points between the means for the two years is statistically significant. The lower quartile for the 1968-69 year exceeded even the median for the previous year. This significant improvement was attributed in large part to the Distar materials and the changes in school orientation and teacher training that accompanied the installation of the Distar programs.

Table 2

Reading Scores of First Grade Students in the 1967-68 and 1968-69 School Years

	Stanford Achievement Test--Reading					
	N	Mean	S.D.	Q1	Median	Q3
1967-68 First Grade (Basal Texts)	112	28.38	16.70	16.75	25.67	37.50
1968-69 First Grade (Distar Systems)	98	39.05	15.67	27.10	34.50	50.25

Joliet, Illinois

The Beginning School Project in Joliet, Illinois, set out in September 1968 to replicate the success seen in the Academic Preschool in Champaign, Illinois. The Keith School, location of the project, is an urban inner-city school. The subjects were chosen by lottery from children in the area served by the school. The heads of families are primarily semi-skilled service workers, welfare recipients, and unemployed. Most of the children were white. Twenty-one 4-year-old children participated in the programs during the 1968-69 school year and the same number of students participated in the 1969-70 school year. The children were divided into three groups of five to nine children and each of the three Distar programs was taught to each group for about 25 minutes a day. The remainder of the time was devoted to traditional preschool activities.

As shown in Table 3, significant gains in IQ were made both years on both the Peabody Picture Vocabulary Test and the Slosson Intelligence Test. The first year, the group mean increased 12 points on the Peabody test, while the group mean increased 11 points in the second year on the same test. On the Slosson test, the first year group mean increased 23 points and the second year group mean increased 28 points.

Table 3

Change in Mean IQ of Preschool Children
in the Beginning School Project

	Peabody IQ		Slosson IQ	
	Mean	S.D.	Mean	S.D.
1968-69 (N=18)				
Pretest	102.2	16.2	114.9	19.3
Posttest	114.5	12.9	137.8	17.8
Gain	12.3*		22.9**	
1969-70 (N=21)				
Pretest	86.1	15.9	97.0	18.7
Posttest	97.4	12.3	125.2	17.1
Gain	11.3*		28.2**	

* Significant at .05 level
** Significant at .01 level

Joliet, Illinois, also used the Distar Reading Program in many of its kindergarten classes in the 1970-71 school year. The data from four schools who used the Distar system showed that the children from three out of the four schools ended their kindergarten year with a mean class placement rating above the national average of 3.0 on the Metropolitan Readiness Test. The students in the fourth school had a mean rating just below the national average. All the kindergarten children in the four schools, approximately 200, participated in the Distar Reading Program. Considering the fact that students in these schools are predominantly black or Spanish descent and the heads of the families in the area are mostly semi-skilled service workers, unskilled laborers, or welfare recipients, the results seem to be very encouraging.

Las Vegas, New Mexico

Las Vegas, New Mexico is a small city in the Southwest that has used the Distar reading, language, and arithmetic programs in the first and second grades of several elementary schools in the 1970-71 school year. The study involved the first and second grades from three schools in rural areas. The heads of the families in these areas are mostly unskilled laborers or farm workers, welfare recipients, migrant workers, or unemployed. The populations of these areas are predominantly of Spanish descent.

The teachers in the first grade had had extensive training in the use of Distar materials. The children were chosen from a low income group to participate in this program. There were approximately 100 first graders in the program. They were taught in small achievement groups for about 30 minutes each day. In May of 1971 they were given the Stanford Achievement Test. The mean grade equivalent scores for the first graders in this study on each part of the SAT are: Reading, 1.7; Paragraph Meaning, 1.7; Vocabulary, 1.7; Spelling, 2.1; Word Study Skills, 2.0; and Arithmetic, 1.9, which are very near the national norm.

The second grade Distar teachers participated in one- to three-week workshops and in-service training. There were no criteria for selecting these students to participate in the Distar program. They only had to live in the school district. The children were taught each part of the program in small achievement groups meeting about 35 minutes each day, beginning in the first grade. All of these children were given the Stanford Achievement Test in May 1971. The mean grade equivalent scores for the second graders in this study on each part of SAT were: Word Reading, 2.6; Paragraph Meaning, 2.4; Spelling, 3.0; Word Study Skills, 2.3; Language, 2.9; Arithmetic Computation, 2.7; and Arithmetic Concepts, 2.6, which are slightly below the national norm.

DIFFUSION

Agency Participation

Most of the initial diffusion activities were conducted by Engelmann and the program staff. Such activities focused on the implementation of a prototype program in the experimental preschool at the University of Illinois, conducting teacher training programs, publication of articles and reports, and selection of publishers for the materials. Commercial publishers started playing a role in diffusion in 1967 when SRA contracted to have materials written for commercial publication with Engelmann and his colleagues.

Field test versions of the Distar program were first disseminated in 1967 when SRA began developmental field testing of the materials. Later versions were made available to Follow-Through sites and other locations beginning in 1968. In 1969 SRA published levels I and II of the Distar Reading Program, and level I of the Arithmetic and Language programs. Level II of the Arithmetic and Language programs were commercially published in 1970. In 1971 supplementary reading materials--the Distar Library Series--were published by SRA, and a set of supplementary games--Distar and Strategy Games--was published by SRA in the beginning of 1972.

Diffusion Strategy

There have not been any identifiable "diffusion strategies" for the Engelmann-Becker model (which includes the Distar Instructional System as a material component), but the Corporation has been taking the following approach to disseminate the technique:

1. To implement the Distar programs on Follow-Through sites.

2. To introduce the model to school districts where there are plans to adopt new curricula for kindergarten or primary grades.

3. To implement a teacher training program for the Engelmann-Becker model in connection with the University teacher training programs.

4. To go into school districts and look for one or two teachers with hard-to-teach children who will try the model. Good results create demand for the Distar program.

5. To provide the Engelmann-Becker model users with necessary teacher training services and materials.

Actual Diffusion Efforts

During the first two years of development (1964-66), the exploratory teaching and the trial of the Bereiter-Engelmann materials took place in an experimental preschool at the University of Illinois. Teaching Disadvantaged Children in the Preschool by Bereiter and Engelmann was published in 1966. This book describes the theory behind the Engelmann-Becker model, basic teaching strategies, and curriculum developed to that point. During the following years, curriculum development continued and some of the materials became available through the University of Illinois Press. The materials were used in several research projects, such as the comparative study of preschool curricula (Weikart, 1969) and studies conducted through the Exemplary Center for Reading Instruction in Salt Lake City, Utah (Knudsen, 1970, and Anderson, 1971).

In 1968, the Engelmann-Becker model was selected by 12 Follow-Through sites and by seven more Follow-Through sites in 1969. Also, three Head Start sites selected the Engelmann-Becker model in 1969. Engelmann-Becker staff held pre-service workshops at all sites before the school year and consulting service was provided during the school year. The Engelmann-Becker Corporation was established in 1969 to handle the problems related to production of the Follow-Through materials and teacher training. The teacher training program for the Engelmann-Becker model continued at the University of Illinois. In 1969 SRA published Engelmann's book Preventing Failure in the Primary Grades, dealing with instructional programming for teaching specific skills in reading, language, and arithmetic. After the Engelmann-Becker staff and the corporation moved to Eugene, Oregon, in the summer of 1970, dissemination efforts have been continued through the teacher training program at the University of Oregon, the implementation of the Engelmann-Becker model and the Distar programs at Follow-Through sites,

and distribution of tryout versions of level III materials through the Engelmann-Becker Corporation.

Science Research Associates, Inc., was interested in the area of education for disadvantaged children and in making instruction more suited to the personal needs of the students. In 1967 they heard about what Engelmann and his staff were doing. Several SRA staff members visited Engelmann and his group at the University of Illinois and were so impressed that the company started to negotiate with Engelmann for the development, publication, and marketing of materials. SRA made a contract with Engelmann and the other co-authors in 1967 to publish and to provide funds for the development and tryout of new materials.

SRA conducted a field test of Reading I during the 1967-68 school year and published the revised reading materials for Follow-Through sites in 1968. To a large extent the current format of the published Distar materials is a result of these developmental efforts by SRA. In 1969 the commercially published Distar Reading I, Reading II, Language I and Arithmetic I materials were available from SRA. The level II Language and Arithmetic materials were published by SRA the next year.

In addition, SRA has published teacher training materials, background information including a set of three booklets presenting the detailed behavioral objectives of the Distar programs, and research data including summaries of 21 case study summaries of the effectiveness of the Distar system. SRA has also published three books relating to the teaching of Engelmann's model: Preventing Failure in the Primary Grades (1969), by Engelmann; An Empirical Basis for Change in Education (1971), by Becker; and Teaching: A Course in Applied Psychology (1971), by Becker, Engelmann and Thomas.

SRA also provides a two-day orientation workshop for new teachers at no cost to the user when the Distar programs are first adopted for use, and SRA can also arrange for consulting and training tailored to the needs of individual school and district situations, based on consultation with client school systems.

Ongoing SRA plans are illustrated by the publication of supplementary materials such as the Distar Library Series (1971) and the Distar and

Strategy Games (1972), and by the planned publication of the level III Distar materials for reading, language, and arithmetic in the 1972-73 school year.

Product Characteristics and Other Factors Affecting Diffusion

The Distar program was developed from specific behavioral objectives. The program is a highly structured instructional system. There are three subject area programs in the commercially published Distar Instructional System: reading, arithmetic, and language. Each of these three subject area programs can be adopted independently from the other areas. Implementation of either all or one of the Distar programs does not depend on any particular form of school organization, such as team teaching, self-contained classrooms, or nongraded systems. However, small group instruction and preservice teacher training are strongly recommended for successful implementation of the Distar system.

The cost per pupil averages about $8.00 per year per subject area, which should not be a significant obstacle for adoption of the program. The careful structure of the Distar program may affect diffusion because of unaccepting attitudes toward structured programs held by members of some educational circles. Also, the need for adequate teacher training may affect how quickly the program is adopted in large scale.

ADOPTION

Extent of Product Use

Distar instructional materials and classroom procedures form the basis of the Engelmann-Becker Follow-Through model which is currently operating at 20 sites across the nation. The children enrolled in Follow-Through classrooms are culturally or educationally disadvantaged children in grades K-3. Science Research Associates estimates that approximately 300,000 children in about 3,000 schools are using Distar programs in the 1971-72 school year. The children are from mostly low socioeconomic levels from both rural and urban school districts. However, adoption of Distar programs by schools whose population is mainly middle class children is gradually increasing.

The Distar programs, in either the field test version or the published version, have been in general use since 1968. As the diffusion activities increased over the last three years, potential adopters have increasingly initiated contacts with either the developer or the publisher, SRA. SRA thinks the demand for Distar will increase in the future.

Installation Procedures

No special physical arrangements, equipment, or classroom facilities are necessary for installing Distar. Distar teachers do not need a particular educational specialty or graduate level preparation. However, the teacher needs to change her traditional view of the teacher's role in the classroom and can profit from pre-service training in order to teach Distar curriculum. The Engelmann-Becker Corporation and SRA offer pre-service and in-service programs for Distar teachers. A school can also utilize the services of field consultants and teacher training materials through the Engelmann-Becker Corporation.

Although the Distar program is a highly structured instructional system, the program does permit teachers to be flexible and creative to meet the needs of her particular classroom. The program is designed and organized for use in a traditional classroom.

FUTURE OF THE PRODUCT

The developers view the Distar program as the leader of an academic program for disadvantaged children in preschool through the primary grades. They have reported that responses from the children in the program and their parents are very positive and demand for the program is growing. However, the publisher and the developers feel that Distar materials are not final products and should be revised as often as possible. They also feel that the teacher training program for the Distar system should be revised and strengthened to keep up with the materials, since the role of the teacher is critical to the success of Distar in the future.

The future of the Distar program seems dependent upon:

1. The degree of improvement the developers are able to make in the next two or three years.

2. The willingness of school districts and the Federal Government to spend extra money for educationally disadvantaged children.

3. The degree of success in retraining teachers in school.

4. The successful implementation of the program in the Engelmann-Becker Follow-Through Model schools.

CRITICAL DECISIONS

The following events are a fair approximation of those crucial decisions made during the eight-year history of the Distar Instructional System. For each decision point, the following information is given: the decision required; the alternatives available; the alternative selected; the forces leading to the selection of a particular alternative; and the consequences resulting from that choice.

Although an attempt has been made to present the critical decisions or turning points in chronological order, it must be clearly pointed out that these decisions were not usually made at one point in time, nor did they necessarily lead to the next decision presented in sequence. Many critical decisions were made simultaneously and required a lengthy period of time. Furthermore, many of the critical decisions led to consequences that affected all subsequent decision-making processes.

Decision 1: To Focus on Disadvantaged Children

The alternatives open under this decision included: (1) developing a curriculum for culturally disadvantaged children; and (2) development of a curriculum for preschoolers from middle class families in general. Since it was well recognized by the original personnel in the project that most educational failures occur among disadvantaged children, it was decided that the target population for the curriculum development would be the disadvantaged. Also, it was felt that should this program prove successful, it could be easily adapted to the children from middle class families or slower learners. This decision turned out to be the right one because in the following year a great deal of interest and national concern was directed to the educational failure of disadvantaged children.

Decision 2: To Develop An Academic Skill Oriented Program

The alternatives open under this decision were the early development of subject matter oriented learning tasks, as opposed to the early development of generalized problem solving or achievement motivation. The first alternative would stress the development of competencies in specific academic skills within subject areas such as reading, arithmetic, and language. The latter option would have developed reasoning skills, general information, or positive attitudes toward learning and school. It was decided to focus on specific academic skills because the most urgent deficits seemed to exist in academic skills.

Decision 3: To Conduct Exploratory Teaching

During the early phases of the program, Engelmann taught regularly in the classroom and explored through his own teaching what the children were able to do and what strategy did work. He believed that personal experience in the classroom was desirable, and sometimes mandatory, for curriculum developers. The decision to conduct exploratory teaching had significant consequences because it greatly helped in preparing teacher training materials and in obtaining feedback for improvement of lessons and teaching strategy.

Decision 4: To Emphasize Teacher Training

During the early phases of the program, Engelmann and Bereiter decided that the teacher training component is as critical as the preparation of teaching materials. This led to (1) preparation of teacher training materials, (2) conducting the Carnegie Teaching Fellow program and other teacher training programs in connection with the University, and (3) conducting pre-service and in-service workshops for users. Former Carnegie Teaching Fellows played a particularly important role in implementing the program in the schools and in training other teachers for the Engelmann-Becker model.

Decision 5: To Form the Engelmann-Becker Corporation

The Engelmann-Becker Corporation was established to handle the problems related to the production of Follow-Through materials and the teacher training program for the Engelmann-Becker model. The establishment of the corporation had significant consequences because the corporation performed a

major role in conducting teacher training programs and in the implementation of the Distar program in Follow-Through sites. The corporation will play an equally important role in further developmental work on the Engelmann-Becker model and in the diffusion of the Distar system.

Decision 6: To Move to Oregon from Illinois

The decision was made to move to the University of Oregon because the effort to gain acceptance of a program in the Engelmann-Becker model including undergraduate teacher training leading to a teacher certificate failed at the University of Illinois. An experimental undergraduate program at the University of Oregon is now in progress. If the objective is not achieved within the next few years at Oregon, the move may turn out to have been unwise since association with the University of Illinois would have been advantageous as far as diffusion activities are concerned.

Decision 7: To Use a Corporation in Combination with a Publishing Firm

The alternatives open under this decision included: (1) to market through a corporation like the Engelmann-Becker Corporation; (2) to select a commercial publisher; and (3) to use a developmen corporation in combination with a commercial publishing firm. The third alternative was selected. This decision was made because the Distar authors felt that marketing would have been beyond their realm of expertise. This decision made it possible to meet the production needs for the Follow-Through sites and also provided funds from the publisher to conduct a field test for the reading, arithmetic and language programs (levels I and II) before commercial publication. Prototype level III programs are disseminated through the Engelmann-Becke. Corporation as well as being monitored by SRA because they are still in the developmental stage.

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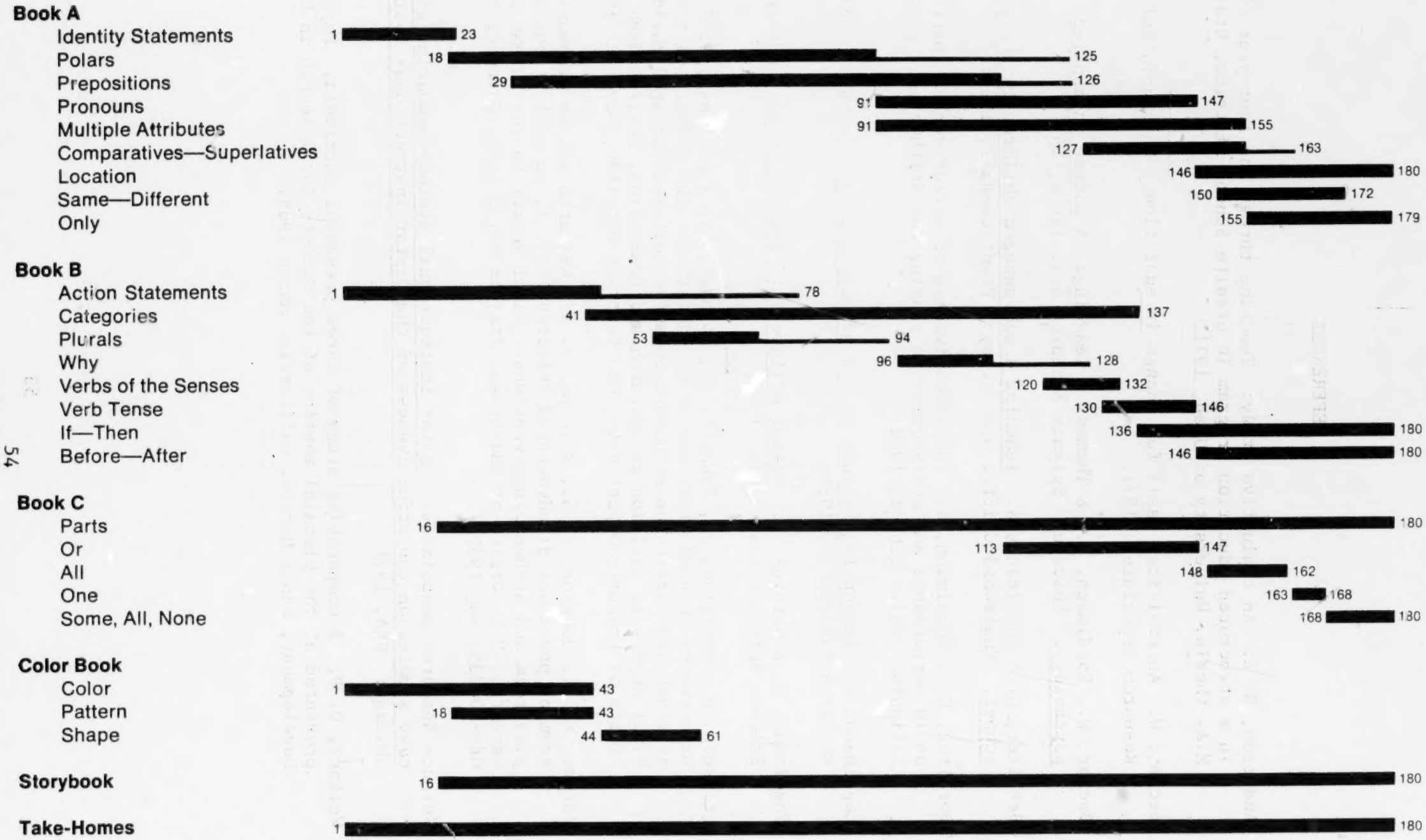
APPENDIX A: DISTAR LANGUAGE I

Scope and Sequence Chart



Distar Language I scope and sequence chart. The numbers at the beginning and end of each bar indicate the first and last presentations in which a concept is taught. The narrowing of a bar indicates that presentation of a concept is tapering off; the concept is not being taught every day.

Locations of the Concepts Introduced in Language I Materials

Content and Location of Tests in Distar Language I

Presentation Book	Test No.	Content	Precedes Presentation
A	1	Identity and Action Statements	1
	2	Identity and Action Statements	16
	3	Polars	23
	4	Prepositions and Polars	43
	5	Under and Next to	59
	6	In front of and In back of	68
	7	Between	80
	8	Multiple Attributes, Pronouns	104
	9	Same	158
	10	Same—Different	173
B	1	Action Statements	40
	2	Categories	63
	3	Plurals	70
	4	Why	110
	5	Verb Tense	140
	6	Before—After	164
C	1	Parts	23
	2	Parts	53
	3	Or	126

Prepositions Taught in Distar Language I, Book A

Preposition	Initial Presentation
Over	29
On	34
In	38
Under	43
Next to	52
In front of	55
In back of	64
Between	70

Polars Taught in Distar Language I, Book A

Polars	Initial Presentation	Polars	Initial Presentation
Long, short	35	Straight, crooked	74
Full, empty	37	Fast, slow	75
Big, little	45	Heavy, light	78
Loud, soft	49	Wet, dry	81
Tall, short	52	Old, new	83
Fat, skinny	55	Soft, hard	86
Hot, cold	67	Old, young	86
Smooth, rough	69	Light, dark	88

Locations Taught in Distar Language I, Book A

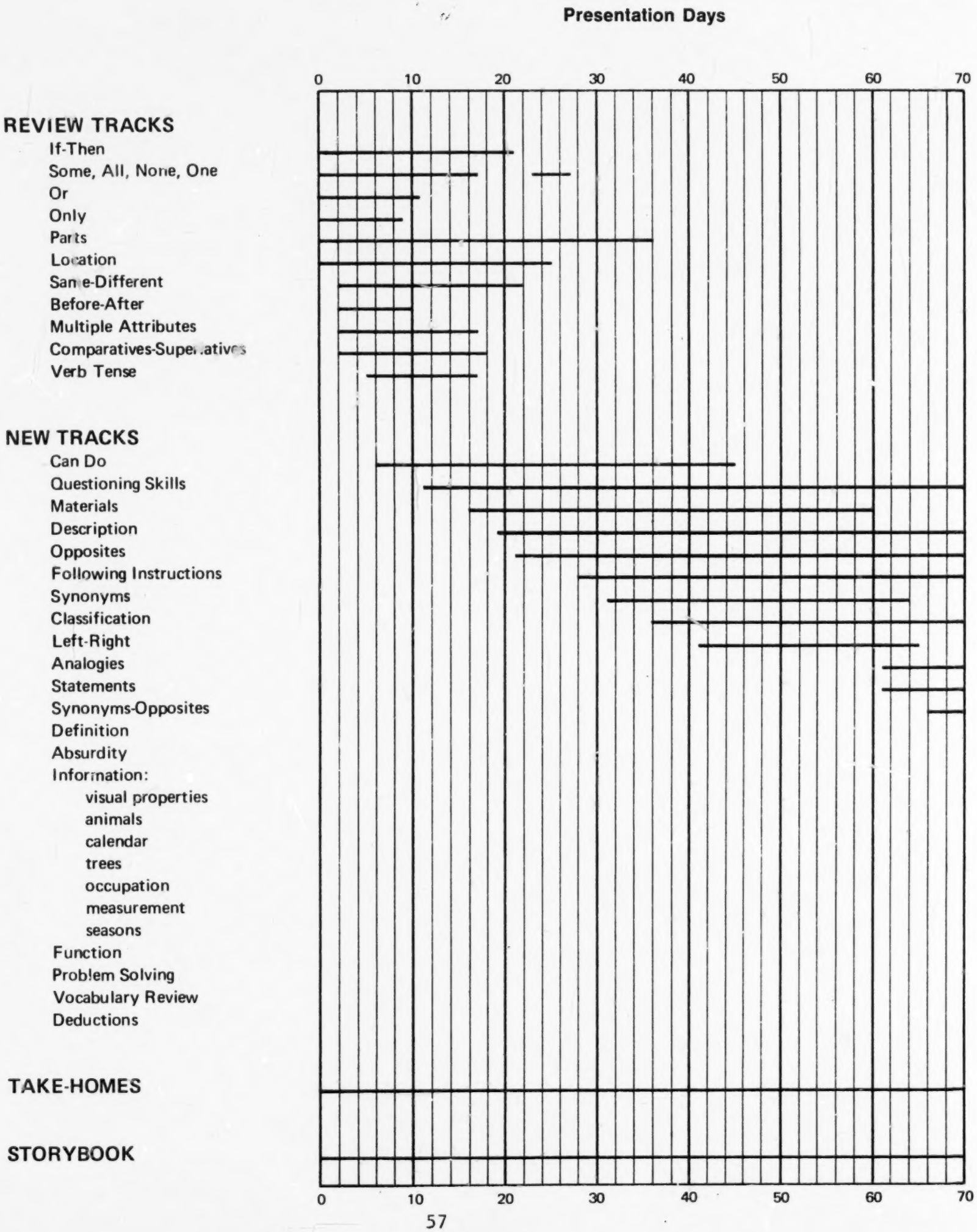
Location	Initial Presentation	Location	Initial Presentation
Sidewalk	146	Airport	164
Shoe store	147	Swimming Pool	165
Cleaners	148	Beach	166
Living room	149	Post office	167
Kitchen	150	Jungle	168
Bedroom	151	Hospital	169
Gas station	152	Zoo	170
Grocery store	153	Garage	171
Clothing store	154	Train station	172
Barbershop	155	Theater	173
City	156	Clinic	174
Schoolroom	157	Restaurant	175
Sky	158	Dentist's office	176
Forest	159	Library	177
Fire station	160	Bus station	178
Police station	161	Ocean	179
Farm	162	Park	180
Barn	163		

Categories Taught in Distar Language I, Book B

Categories	Initial Presentation
Vehicles	41
Food	44
Containers	59
Animals	71
Buildings	79
Clothing	85
Plants	89
Furniture	100
Tools	108
Appliances	124

Objects Used to Teach Parts in Distar Language I, Book C

Object Used	Initial Presentation	Object Used	Initial Presentation
Match	16	Window	85
Shovel	18	Mouth	86
Cup	20	Coat	88
Pencil	22	Eye	89
Hammer	24	Pants	91
Hat	26	Broom	94
Purse	29	Glove	97
Wagon	32	Car	98
Egg	36	Rake	101
Sandal	39	Dashboard	104
Pot	41	Knife	104
Table	45	Windshield	107
Umbrella	49	Truck	108
Fish	52	Toothbrush	109
Tree	54	Jar	111
Nail	56	Belt	112
Shoe	58	Chair	114
Body	60	Lamp	118
Head	63	Garbage Can	124
Turtle	63	Boot	127
Flower	65	Spoon	132
Torso	68	Cap	135
Jacket	69	Cake	141
Arm	71	Clock	143
Glasses	74	Cabinet	147
Hand	75	Refrigerator	151
Pin	77	Door	156
Leg	79	Closet	158
Foot	81	Staircase	161
Shirt	81	Airplane	166
Nose	84		


Presentation Days
0
10
20
30
40
50
60
70
REVIEW TRACKS
If-Then
Some, All, None, One
Or
Only
Parts
Location
Same-Different
Before-After
Multiple Attributes
Comparatives-Superlatives
Verb Tense
NEW TRACKS
Can Do
Questioning Skills
Materials
Description
Opposites
Following Instructions
Synonyms
Classification
Left-Right
Analogies
Statements
Synonyms-Opposites
Definition
Absurdity
Information:
visual properties
animals
calendar
trees
occupation
measurement
seasons
Function
Problem Solving
Vocabulary Review
Deductions
TAKE-HOMES
STORYBOOK

DISTAR LANGUAGE II

Sequence Chart

The Language II tracks appear in the left-hand column. The numbers at the top and bottom of the chart indicate the 180 presentations in the program. Each horizontal bar indicates the range of presentations in which a track is taught. A break in the bar is shown if the track is not taught for as many as five consecutive days.

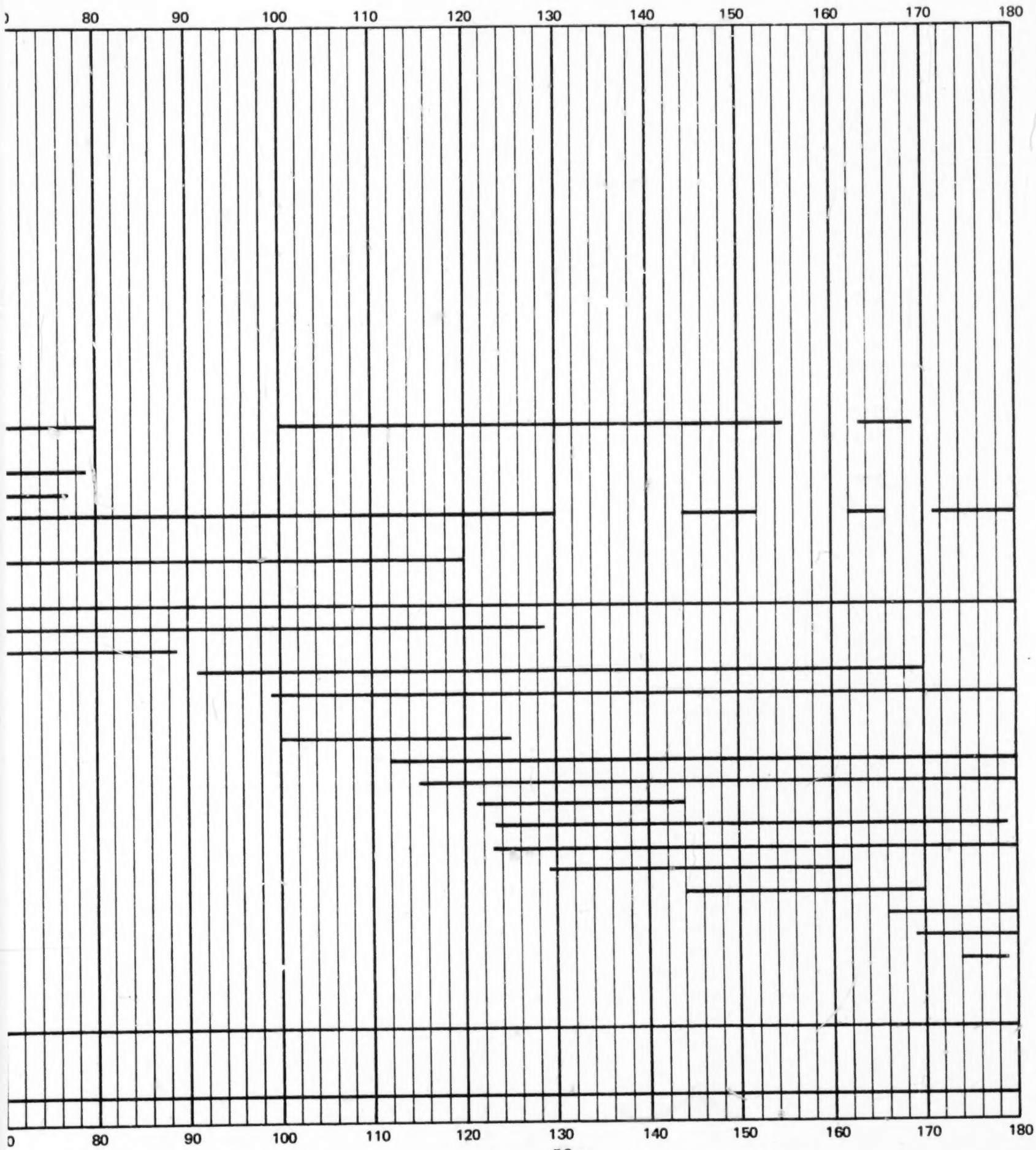


TABLE 1. Objects Used to Teach Parts in Distar Language II

Object Used	Initial Presentation	Object Used	Initial Presentation
cup	1	mouth	12
umbrella	1	eye	12
match	1	shovel	13
pencil	2	table	13
hammer	2	jar	13
hat	2	cap	14
egg	2	boot	14
wagon	2	spoon	14
sandal	2	kite	15
sled	3	car	16
arm	4	truck	16
leg	4	inside of car	18
hand	4	outside of car	18
foot	4	lamp	18
pin	4	belt	18
glasses	4	chair	18
jacket	4	airplane	19
pot	5	jet airplane	19
purse	5	sailboat	20
fish	6	rake	21
tree	6	knife	21
nail	6	toothbrush	21
book	7	telephone	22
coat	8	glove	25
window	8	broom	25
shirt	8	pants	25
body	9	cabinet	26
head	9	refrigerator	26
torso	9	garbage can	26
shoe	10	bicycle	27
clock	10	staircase	30
bed	11	closet	32
nose	12		

TABLE 2. Materials Taught in Distar Language II

Material	Initial Presentation
wood	16
cloth	18
brick	20
paper	22
cardboard	23
metal	24
leather	25
concrete	32
glass	34
plastic	36
rubber	38
china	40

TABLE 3. Locations Taught in Distar Language II

Location	Initial Presentation
beauty shop	1
forest	1
farm	2
beach	3
pet shop	3
interior of a car	4
post office	5
interior of a bus	6
clinic	7
passenger car of a train	8
movie theater	8
restaurant	9
bank	10
grocery store	10
garage	11
shoe repair shop	12
zoo	12
church	13
gas station	13
airport	14
shoe store	14
playground	15
hospital	16
cleaners	16
city	17
hotel lobby	18
kitchen	18
library	19
drugstore	20
bus station	21
in the water	21
fire station	22
sidewalk	22
sky	23
bed	23
barn	24
school	24
jungle	25

TABLE 4. Information Taught about the Calendar in Distar Language II

Information	Initial Presentation
week = 7 days	115
year = 12 months	125
month = 31 days	129
year = 365 days	155
month = 4 weeks	165
year = 52 weeks	174

TABLE 5. Information Taught about Measurement in Distar Language II

Information	Initial Presentation
ruler, yardstick – instruments used to measure length	125
foot, yard – units used to measure length	125
foot = 12 inches	125
yard = 3 feet = 36 inches	125
mile – unit used to measure length	130
mile = 5280 feet	130
speedometer – instrument used to measure speed	135
miles per hour – units used to measure speed	135
clock, watch – instruments used to measure time	140
seconds, minutes, hours – units used to measure time	140
second – smallest unit used to measure time	140
minute = 60 seconds	142
hour = 60 minutes	142
day = 24 hours	143
thermometer – instrument used to measure temperature	151
temperature – how hot or cold something is	151
degrees – units used to measure temperature	151
about 98 degrees – normal temperature of human body	151
212 degrees – temperature at which water turns to steam	159
32 degrees – temperature at which water turns to ice	159

TABLE 6. Occupations Taught in Distar Language II

Occupation	Initial Presentation	Occupation	Initial Presentation
librarian	123	cowboy	149
grocer	125	heavy equipment operator	150
mailman	126	scientist	151
construction worker	127	singer	152
butcher	128	deep-sea diver	153
lumberjack	129	cook	154
coal miner	130	surveyor	155
plumber	132	carpenter	156
secretary	133	telephone operator	157
electrician	134	fireman	162
photographer	135		
factory worker	137		
dentist	139		
policeman	140		
veterinarian	141		
taxi driver	142		
painter	143		
mechanic	144		
hairdresser	145		
judge	146		
truck driver	147		
waitress	148		

APPENDIX C

LIST OF PRODUCTS AND DEVELOPERS

The following is a list of products for which Product Development Reports have been prepared.

Arithmetic Proficiency Training Program (APTP)
Developer: Science Research Associates, Inc.

The Creative Learning Group Drug Education Program
Developer: The Creative Learning Group
Cambridge, Massachusetts

The Cluster Concept Program
Developer: The University of Maryland,
Industrial Education Department

Developmental Economic Education Program (DEEP)
Developer: Joint Council on Economic Education

Distar Instructional System
Developer: Siegfried Engelmann & Associates

Facilitating Inquiry in the Classroom
Developer: Northwest Regional Educational Laboratory

First Year Communication Skills Program
Developer: Southwest Regional Laboratory for
Educational Research & Development

The Frostig Program for Perceptual-Motor Development
Developer: The Marianne Frostig Center of Educational Therapy

Hawaii English Program
Developer: The Hawaii State Department of Education
and The University of Hawaii

Holt Social Studies Curriculum
Developer: Carnegie Social Studies Curriculum Development Center,
Carnegie-Mellon University

Individually Prescribed Instruction--Mathematics (IPI--Math)
Developer: Learning Research and Development Center,
University of Pittsburgh

Intermediate Science Curriculum Study
Developer: The Florida State University,
Intermediate Science Curriculum Study Project

MATCH--Materials and Activities for Teachers and Children
Developer: The Children's Museum
Boston, Massachusetts

Program for Learning in Accordance With Needs (PLAN)
Developer: American Institutes for Research and
Westinghouse Learning Corporation

Science--A Process Approach
Developer: American Association for the Advancement of Science

Science Curriculum Improvement Study
Developer: Science Curriculum Improvement Study Project
University of California, Berkeley

Sesame Street
Developer: Children's Television Workshop

The Sullivan Reading Program
Developer: Sullivan Associates
Menlo Park, California

The Taba Social Studies Curriculum
Developer: The Taba Social Studies Curriculum Project
San Francisco State College

The Talking Typewriter or
The Edison Responsive Environment Learning System
Developer: Thomas A. Edison Laboratory,
a Subsidiary of McGraw Edison Company

Variable Modular Scheduling Via Computer
Developer: Stanford University and
Educational Coordinates, Inc.